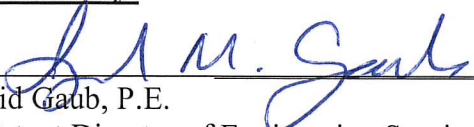


ENGINEERING DESIGN STANDARDS

JANUARY 1, 2017

City of Auburn
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12/29/2016
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TABLE OF CONTENTS

Chapter 1	General Information.....	14
1.00	Definitions	14
1.01	Preface	20
1.02	Contact Information	20
1.03	Reference Material	21
1.03.1	City Reference Material.....	21
1.03.1.1	City of Auburn Surface Water Management Manual (SWMM)	21
1.03.1.2	City of Auburn Engineering Construction Standards Manual.....	21
1.03.1.3	Planning Documents	21
1.03.1.4	Informational Handouts	22
1.03.1.5	Technical Memos	22
1.03.2	Other Reference Material	22
1.04	Deviation from Standards	23
1.04.1	General Deviations	23
1.04.2	Surface Water Management Manual (SWMM) Deviations.....	24
1.04.2.2	The Ten Minimum Requirements.....	24
1.04.2.3	Deviation Process	24
1.05	Appeal of City Engineer’s Decision	24
1.06	Changes to Standards.....	25
Chapter 2	Plan Approval Process	26
2.00	Preface	26
2.01	Types of Plans.....	26
2.02	Grading Plans	26
2.02.1	Building Site Plans	26
2.02.2	Public Facility Extension (FAC) Plans	27
2.02.3	Other Plans.....	27
2.03	Review and Approval Process	28
2.03.1	Submittals	28
2.03.2	City Review	29
2.03.3	Plan Approval	29

2.03.4	Project Close Out.....	30
Chapter 3	Plan Preparation Requirements	31
3.00	Preface	31
3.01	General Requirements	31
3.02	Plan Format	31
3.02.1	Grading Plans	31
3.02.2	Building Site Plans	32
3.02.3	Facility Extension (FAC) Plans	32
3.03	General Plan Requirements	33
3.03.1	Standard Plan Format.....	33
3.03.2	Drafting Standards	33
3.04	Plan Sheet Elements.....	34
3.04.1	Cover Sheet	34
3.04.2	Temporary Erosion and Sediment Control (TESC) Plan Sheet	35
3.04.3	Grading and Private Storm Drainage Plan Sheet.....	35
3.04.4	Cross-Section Sheet.....	37
3.04.5	Detail Sheet	37
3.04.6	Public Storm Drainage Plan Sheet	37
3.04.7	Utility Plan Sheet	39
3.04.7.1	Water	39
3.04.7.2	Sanitary Sewer.....	39
3.04.8	Utility Profile Sheet	40
3.04.8.1	Storm Drainage	40
3.04.8.2	Water	40
3.04.8.3	Sanitary Sewer.....	41
3.04.9	Public Street Plan and Profile Sheet	41
3.04.9.1	Plan View	41
3.04.9.2	Profile	42
3.04.9.3	Intersections.....	42
3.04.9.4	Typical Roadway Sections	44
3.04.9.5	Striping and Signing.....	44
3.04.9.6	Signalization	44

3.04.9.7	Illumination	46
3.04.9.8	Streetscape.....	47
3.04.9.9	Other Features	48
3.04.10	Site Landscape Plan Sheet	48
3.04.11	Site Irrigation Plan sheet	48
3.04.12	Critical Area Restoration/Mitigation	48
3.04.13	City Parks and Open Spaces	49
Chapter 4	Report Preparation Requirements	57
4.00	Preface	57
4.01	General Requirements	57
4.02	Report Types	57
4.03	Report Requirements	57
4.03.1	Geotechnical Reports	57
4.03.2	Stormwater Site Plan Report.....	58
4.03.3	Critical Area Report	58
4.03.4	Traffic Impact Analysis	59
4.03.5	Construction Stormwater Pollution Prevention Plan (SWPPP)	59
4.03.6	Other Reports.....	59
Chapter 5	TESC, Clearing and Grading	60
5.00	Preface	60
5.01	TESC Design Criteria	60
5.01.1	Temporary Erosion and Sediment Control (TESC).....	60
5.01.2	Temporary Detention Systems.....	60
5.01.3	Construction SWPPP	60
5.02	Land Clearing.....	61
5.02.1	Purpose	61
5.02.2	Plan/Permit Requirements.....	61
5.02.3	General Requirements	62
5.03	Grading.....	62
5.03.1	Purpose	62
5.03.2	Excavations.....	62
5.03.3	Fills	63

5.03.3.1	Preparation for Fill.....	63
5.03.3.2	Compaction	63
5.03.3.3	Slope Easement	64
5.04	Retaining Walls.....	64
5.04.1	Rockerries	64
5.04.1.1	Size	64
5.04.1.2	Material.....	64
5.04.1.3	Underdrains.....	64
5.04.2	Block Retaining Walls	65
5.04.2.1	Material.....	65
5.04.2.2	Underdrains.....	65
5.04.3	Reinforced Concrete Walls	65
5.04.3.1	Material.....	65
5.04.3.2	Underdrains.....	65
5.04.4	Mechanically Stabilized Earth Walls (MSE Walls).....	65
5.04.4.1	Material.....	65
5.04.4.2	Underdrains.....	66
5.05	Construction Sequence	66
5.05.1	Requirements	66
Chapter 6	- Storm Drainage Facilities	67
6.00	Preface	67
6.01	SWMM Requirements.....	67
6.02	Additional Requirements	68
6.02.1	Storm Drainage Pipes and Structures.....	68
Chapter 7	Water Facilities.....	69
7.00	Preface	69
7.01	Design Criteria.....	69
7.01.1	Water Mains.....	69
7.01.1.1	Water Main Sizing	69
7.01.1.2	Water Main Location.....	70
7.01.1.3	Water Main Fittings.....	70
7.01.2	Water Services	71

7.01.2.1	Domestic Services.....	71
7.01.2.2	Other Services	72
7.01.3	Water Valves	72
7.01.3.1	Water Valve Sizing.....	72
7.01.3.2	Water Valve Location	72
7.01.4	Cross Connection Control.....	73
7.01.4.1	Domestic Services	73
7.01.4.2	Irrigation Services.....	73
7.01.4.3	Fire Line Connections	73
7.01.4.4	General	74
7.01.5	Pressure Reducing Stations	74
7.01.6	Fire Systems	74
7.01.6.1	Fire Hydrant Assemblies.....	74
7.01.6.2	Fire Sprinkler Systems	75
7.01.6.3	Fire Flows	76
7.01.6.4	Fire Authority and Hydrant Access.....	76
7.02	Public Water Utility Easements.....	77
7.03	Material Requirements for Water Systems.....	77
Chapter 8	Sanitary Sewer Facilities.....	78
8.00	Preface	78
8.01	Design Criteria	78
8.01.1	Sanitary Sewer Mains.....	78
8.01.1.1	Sanitary Sewer Main Sizing/Slope	78
8.01.1.2	Sanitary Sewer Main Location	79
8.01.2	Sanitary Sewer Manholes.....	81
8.01.2.1	Sanitary Sewer Manhole Type and Size	81
8.01.2.2	Sanitary Sewer Manhole Locations	82
8.01.2.3	Sanitary Sewer Manhole Parameters.....	82
8.01.3	Side Sewers	83
8.01.3.1	Side Sewer Parameters (See Figure 8-03)	83
8.01.4	Oil/Water Separators	85
8.01.5	Sanitary Sewer Pumps.....	86

8.01.6	Sanitary Sewer Meters	86
8.02	Public Sanitary Sewer Utility Easements	86
8.03	Material Requirements for Sanitary Sewer Systems	87
8.03.1	Sanitary Sewer Pipes	87
Chapter 9	Utilities	88
9.00	Preface	88
9.01	Design Criteria	88
9.01.1	Private Utilities Located Within City Right-of-Way	88
9.01.1.1	Private Utilities Located Underground	88
9.01.1.2	Private Utilities Located Aboveground	88
9.01.2	Public and Private Utilities Located Underground Within City Right-of-Way	89
9.01.2.1	Perpendicular (Transverse) Trenching in Asphalt Pavement	89
9.01.2.2	Longitudinal Trenching in Asphalt Pavement	90
9.01.2.3	Trenching in Concrete Pavement	90
9.01.2.4	Trenching in Other Right-of-Way Surfaces	90
Chapter 10	Streets	92
10.00	Preface	92
10.01	Street Classification	92
10.01.1	Arterials	92
10.01.1.1	Principal Arterial	93
10.01.1.2	Minor Arterial	94
10.01.2	Collectors	95
10.01.2.1	Residential Collector	95
10.01.2.2	Non-Residential Collector	96
10.01.2.3	Rustic Collector	97
10.01.3	Local Streets	98
10.01.3.1	Local Residential	98
10.01.3.2	Local Non-Residential	100
10.01.3.3	Rustic Residential	101
10.01.4	Alleys	101
10.01.5	Half Streets	102
10.01.6	Private Access Roads on Access Tracts or Easements (Shared Driveways) ...	103

10.01.7	Private Street.....	104
10.02	Street Geometry.....	104
10.02.1	Minimum Horizontal Curve Radius	104
10.02.2	Tangents Between Reverse Curves	104
10.02.3	Superelevations.....	105
10.02.4	Vertical Grades	105
10.02.5	Vertical Curves	105
10.02.6	Cross Slopes.....	106
10.02.7	Posted and Design Speed	106
10.02.8	Right of Way	106
10.02.9	Roadway Width (Travel Way).....	106
10.02.9.1	Inside Through Lanes and Curb Lanes	106
10.02.9.2	Center Turn Lanes	107
10.02.9.3	Other Lanes	107
10.02.9.4	Road Edge.....	107
10.02.9.5	On-Street Parking	107
10.02.9.6	Intersection Curb Radii	108
10.02.10	Street Layout	108
10.02.10.1	Local Residential Streets.....	108
10.02.10.2	Other Streets	109
10.02.10.3	Cul-de-sacs	109
10.2.10.3.1	Temporary Cul-de-sacs.....	109
10.2.10.3.2	Permanent Cul-de-Sacs	110
10.2.10.4	Traffic Volumes	110
10.03	Sight Distance.....	110
10.03.1	Stopping Sight Distance.....	110
10.03.2	Intersection Sight Distance.....	111
10.03.3	Major Road and Minor Road	114
10.03.4	Sight Triangles	114
10.03.4.1	Measurements	114
10.03.4.2	Restrictions.....	115
10.03.4.3	Right-of-Way Requirements.....	115

10.03.4.4	Uncontrolled Intersections.....	115
10.03.4.5	Two Way Stop Controlled Intersections.....	115
10.03.4.6	All Way Stop Controlled Intersections	118
10.03.4.7	Signalized Intersections.....	118
10.03.2	Decision Sight Distance	118
10.03.3	Passing Sight Distance	118
10.04	Street Access Points	118
10.04.1	Public Street Intersections	118
10.04.1.1	Intersection Spacing.....	118
10.04.1.2	Horizontal Approach Angle	119
10.04.1.3	Intersection Approach Offsets	119
10.04.1.4	Curb and Right-of-Way Radius	119
10.04.1.5	Landing Approach.....	120
10.04.2	Private Street Intersections.....	120
10.04.3	Driveways	120
10.04.3.1	Driveway Locations	120
10.04.3.1.1	Functional Intersection Boundary.....	121
10.04.3.2	Driveway Lay Out	124
10.04.3.3	Driveway Alignment (Horizontal and Vertical).....	124
10.04.4	Driveway Widths	124
10.04.4.1	Residential.....	124
10.04.4.2	Commercial/Industrial	124
10.04.5	Restricted Access Driveways	125
10.05	Sidewalks.....	125
10.05.1	Sidewalk Widths	125
10.05.1.1	Downtown Auburn	126
10.05.1.2	Structural Section	126
10.05.2	Meandering Sidewalks	126
10.05.3	Accessibility	126
10.05.3.1	Curb Ramps	126
10.06	Bikeways.....	126
10.06.1	Bikeway Classifications.....	127

10.06.1.1	Class I Bikeway	127
10.06.1.1.1	Width	127
10.06.1.1.2	Structural Section.....	127
10.06.1.1.3	Geometrics	127
10.06.1.1.4	Buffer	127
10.06.1.1.5	Driveway Crossings	128
10.06.1.1.6	Ownership	128
10.06.1.2	Class II Bikeway	128
10.06.1.2.1	Width	128
10.06.1.2.2	Structural Section.....	128
10.06.1.2.3	Geometrics	128
10.06.1.3	Class III Bikeway	128
10.06.1.3.1	Width	128
10.06.1.3.2	Structural Section.....	129
10.06.1.3.3	Geometrics	129
10.06.1.4	Class IV Bikeway	129
10.06.2	Bikeways at Railroad Crossings	129
10.06.3	Bikeways at Roundabouts	129
10.06.4	Bikeways at Signalized Intersections.....	129
10.06.5	Bikeways at Unsignalized Intersections	129
10.06.6	Bikeway Pavement Markings, Signing, and Striping.....	130
10.07	Pavement Design	130
10.07.1	Design Requirements	130
10.07.1.1	Street Classification	130
10.07.1.2	Street Subgrade.....	130
10.07.1.3	Street Pavement Sections	131
10.07.2	Pavement Section Design Chart	131
10.07.3	Requirements for Engineered Pavement Sections.....	132
10.07.3.1	Pavement Design Requirements	132
10.07.3.2	Soils Classifications and California Bearing Ratio	133
10.07.3.2.1	Poor Soils.....	133
10.07.3.2.2	Medium Soils.....	133

10.07.3.2.3	Good Soils	133
10.07.3.2.4	Excellent Soils.....	133
10.07.3.2.5	Unified Soils Classification Symbols	134
10.07.3.3	Report Submittal	134
10.07.4	Materials Specifications	134
10.07.4.1	Gravel Base.....	134
10.07.4.2	Crushed Rock.....	135
10.07.4.3	Asphalt Concrete Pavement.....	135
10.07.5	Permeable Pavements for Roads, Access Tracts, and Driveways.....	135
10.08	Landscaping.....	136
10.08.1	General Landscaping Requirements.....	136
10.08.2	Landscape Strip Components.....	136
10.08.3	Landscape Strip Dimensions.....	136
10.08.4	Plant Layers	137
10.08.5	Trees.....	137
10.08.5.1	Placement and Spacing	137
10.08.5.2	Tree Canopy Shape.....	138
10.08.5.2.1	V-Shaped Trees	138
10.08.5.2.2	Pyramidal Trees.....	138
10.08.5.2.3	Round Trees	138
10.08.5.2.4	Oval Trees	138
10.08.5.2.5	Columnar Trees	138
10.08.5.3	Root Direction Devices	139
10.08.5.4	Tree Planting Wells and Grates	139
10.08.6	Plant Selection.....	139
10.08.7	Plant Selection Table	139
10.08.8	Planting Methods and Maintenance	145
10.08.9	Establishment Period	145
10.08.10	Irrigation Systems.....	145
10.09	Mailboxes.....	145
10.09.1	Mailbox Locations	145
10.09.2	Mailbox Installation.....	145

10.10	Illumination	146
10.10.1	General	146
10.10.2	Design	146
10.10.3	Lighting Schedule	146
10.10.4	Light Standard Foundations	147
10.10.5	Service Cabinet	147
10.10.6	Service Cabinet Foundations	148
10.10.7	Conduit	148
10.10.8	Junction Boxes	148
10.10.9	Light Standards	148
10.10.10	Light Standard Handholes	149
10.10.11	Photoelectric Controls	149
10.10.12	Luminaires	149
10.11	Survey Monuments	150
10.12	Guardrail	150
10.13	Bollards	150
10.14	Transit Stops	150
10.14.1	Bus Pullout Requirements	150
10.14.2	Locations for Bus Pullouts	151
10.14.3	Design of Bus Pullouts	151
10.14.4	Bus Stop Requirements	151
10.14.5	Locations for Bus Stops	151
10.14.6	Bus Stops Features	152
10.15	Traffic Control Devices	152
10.15.1	Median Islands	152
10.15.1.1	Median Island Design	152
10.15.2	Traffic "C" Curbs	153
10.15.2.1	Traffic "C" Curb Design	153
10.15.3	"Pork Chop" Islands	153
10.15.4	Signing	153
10.15.5	Pavement Markings	154
10.15.5.1	Crosswalks	154

10.15.5.2	Left-turn Channelization.....	154
10.15.5.3	Lane Division	154
10.15.5.4	Painted Islands	154
10.15.5.5	Two-way Left-turn Lanes.....	155
10.15.5.5	Other Pavement Markings	155
10.15.6	Construction Area Temporary Traffic Control.....	155
10.15.7	Roadway Barricades	155
10.15.8	Traffic Signals	156
10.16	Traffic Impact Analysis	156
10.16.1	When Traffic Impact Analyses are Required	156
10.16.2	Elements of a Traffic Impact Analysis.....	156
10.16.3	Special Uses.....	157
10.16.4	Mitigation Identification	157
10.16.5	Recommendations	157
10.16.6	Area Circulation Plan	158
Chapter 11	City Telecommunication Utility.....	160
11.00	Preface	160
11.01	Design Criteria	160
11.01.1	Conduits	160
11.01.2	Splice Vaults and Pull Boxes	160

Chapter 1 General Information

1.02 Definitions

Note that additional definitions are included in the documents referenced in Section 1.03.

AASHTO - American Association of State Highway and Transportation Officials.

Access Point - A driveway or private street that connects to the general public street system. A public street is not considered an access point.

ACP - Asphalt Concrete Pavement.

Activity Centers - Locations such as schools, parks, retail areas and shopping centers, places of employment, or public service areas that attract people.

ADT - Average Daily Traffic. The total two-directional volume of traffic passing through a given point during a given time period, divided by the number of days in that time period.

Aggregate - A mixture of various soil components (e.g. sand, gravel, and silt).

Alley - Right-of-way, usually narrower than a street with an all-weather surface, which provides access to the rear boundary of two (2) or more residential or non-residential properties and is not intended for general traffic circulation.

Applicant - The owner or their agent seeking approval from the city for any land use or other related permit or approval referenced in City of Auburn Code and which requires utilization of these Standards. References: See Developer.

Appurtenance - Equipment and/or accessories that are a necessary part of an operating utility system or subsystem.

APWA - American Public Works Association.

ASTM - American Society for Testing and Materials.

Backfill - Replacement of excavated material with suitable material compacted as specified.

Backwater - Water held back by some obstruction, natural or artificial.

Backwater Curve - A plot of depth versus location along the channel containing backwater.

Bicycle Facilities - A general term referring to improvements that accommodate or encourage bicycling, including parking facilities, bike racks, bicycle route mapping and bicycle route development.

Boring/Jacking - Grade and alignment-controlled mechanical or other method of installing a pipe or casing under a street without disturbing the surrounding medium.

Breakaway Structure or Breakaway Design - A structure or installation that has been crash tested in accordance with National Cooperative Highway Research Program procedures. (NCHRP 230).

Capacity – (1) The maximum number of vehicles that have a reasonable expectation of passing over a given roadway or section of roadway in one direction during a given time period under prevailing roadway and traffic conditions. (2) The volume of liquid or gas that can be transported by a pipe. (3) The load-carrying limit of a structure.

Carrier - Pipe directly enclosing a transmitted fluid or gas.

Casing - A larger pipe enclosing a carrier for the purpose of providing structural or other protection to the carrier and/or to allow for carrier replacement without re-excavation, jacking or boring.

CF - Cubic Feet.

Channelization - The separation or regulation of conflicting traffic movements into definite paths of travel by the use of pavement markings, raised islands or other suitable means to facilitate the safe and orderly movement of both vehicles and pedestrians.

Check - A short section of built-up channel placed in a canal or irrigation ditch and provided with gates or flashboards to control flow or raise upstream level for diversion.

Check Dam – Short berm used as erosion protection on steep drainage ditches.

City - The City Engineer or any designee thereof. References: See City Engineer.

City Council - The city legislative authority.

City Engineer - The City Engineer for the City of Auburn. References: See Engineer.

Clean-Out - A pipe through which plumbing snakes can be pushed to unplug a sewer.

Clear Zone - The total streetside border area, starting at the edge of traveled way, available for safe use by errant vehicles. This area may consist of a shoulder, a recoverable slope, a non-recoverable slope, and/or a clear run-out area. The desired width is dependent upon the traffic volumes, speeds, and the streetside geometry.

CMP - Corrugated Metal Pipe.

Coating - Protective material applied to the exterior of a pipe or conduit to prevent or reduce abrasion and/or corrosion damage.

CY - Cubic Yard.

Dedication - The transfer of land or the interest of land by the owner of such land to the City for public uses, reserving no other rights than such are compatible with the full exercise and enjoyment of the uses the property has been dedicated.

Conduit - An enclosed tubular runway for protecting wires or cables.

Contractor - The individual, partnership, firm, corporation or joint venture, contracting with the Developer to do prescribed work.

Commercial Property Use - Property with residential developments with four or more dwelling units per parcel or commercial developments. This is consistent with building permit administration in City of Auburn.

Concrete Plain - Concrete that is not reinforced with steel.

Concrete Thrust Blocking – Concrete that is used to support fittings in water mains.

Control Zone - That Streetside area defined by the "Control Zone Distance Table"; found in Appendix 5 of the WSDOT Utilities Manual, within the street right-of-way in which placement of utility objects is controlled.

Corporation Stop – A brass fitting used to connect service lines to a water main.

Cover - Depth to top of pipe, conduit, casing or gallery below the grade of a street or ditch.

Cross Connection - Connecting fire, irrigation and drinking water supplies together, or connecting storm and sanitary sewers together.

Cul-de-sac - A street closed at one (1) end by widened pavement of sufficient width for vehicles to turn around.

CSBC - Crushed Surfacing Base Course.

CSTC - Crushed Surfacing Top Course.

Dead End Street - Street that accesses the roadway system only at one end. Dead end streets are permanent conditions and should end in a cul-de-sac where appropriate. See Also Stub End Street.

Design Speed - Design speed is the maximum safe speed that can be maintained when conditions are so favorable that the design features of the highway govern.

Detention Tanks and Vaults - Detention tanks and vaults are underground facilities for the storage of surface water. Tanks are typically constructed from corrugated metal pipe. Vaults are constructed from reinforced concrete.

Detention Time - The average time spent by water in a basin or structure.

Developer - The Owner and any agent of the Owner authorized to represent the Owner. References see Applicant.

Development - All structures and other modifications of the natural site above and below ground on a particular site.

DHV - Design Hour Volume. Hourly traffic volume used for street design and capacity analysis, usually one or more peak hours during a 24-hour period.

Director - The Director of the City of Auburn Community Development & Public Works Department or his/her authorized representative.

Drain - Appurtenances to discharge accumulated liquids from casings or other enclosures.

Driveway Approach - See Access Point.

Easement - A right to use or control the property of another for designated purposes.

Edge of Traveled Way - The face of curb for streets that are, or will be constructed to urban standards and the edge of pavement (not shoulder) for streets that are, or will be constructed to rural standards.

Embankment - A raised structure constructed of natural soil from an excavation or borrow source.

Encroachment - Occupancy of city right-of-way by non-roadway structures or other objects of any kind.

Engineer - The City Engineer for City of Auburn or any designee thereof.

Force Main - A sewer line that is pressurized.

Franchise - Occupancy and use document granted by the city required for occupancy of street rights of way.

Geometrics - The arrangement of the visible elements of a street such as alignment, grade, sight distance, widths, and slopes.

Grade - Rate or percent of change in slope, either ascending or descending from or along the roadway. It is measured along the centerline of the roadway or access point.

Gravity Distribution - A water supply that uses natural flow from an elevated tank or mountain reservoir to supply pressure.

Hazard - A side slope, an object, water, or a drainage device that, if impacted, would apply unacceptable impact forces on the vehicle occupants or place the occupants in a hazardous position. It may be either natural or man-made.

Headwall - Entrance to a culvert or sluiceway.

Hydraulic Jump - The rapid change in the depth of flow from a low stage to a high stage resulting in an abrupt rise of water surface.

Impervious Layer - A geologic layer through which no water can pass.

Infiltration – (1) The act of stormwater permeating into the ground. (2) Groundwater that enters sewer pipe through cracks and joints, or the movement of water through the upper soil.

Interception - Rain that falls on vegetation and other impervious objects, which evaporates without contributing to the runoff.

Intersection Sight Distance - The distance required for a vehicle, traveling at or near the posted speed on a major street, to reduce speed to avoid overtaking a vehicle, which has entered the intersection from the minor street. The entering vehicle can be making right, left-turning movements or crossings.

Island - A defined area between traffic lanes for control of vehicle movements and/or for pedestrian refuge.

Joint Use Driveway Tract - A jointly owned and maintained tract or easement serving two (2) properties.

Landing - A road or driveway approach area to any public or private road.

Lateral - A sewer line that goes off at right angles to another.

LF - Linear Feet.

Manhole - An opening in an underground utility system into which workers or others may enter for the purpose of making installations, inspections, repairs, connections, cleaning, and testing.

Median - That portion of a divided roadway separating the traveled ways for traffic in opposite directions.

Mode Split - The percentage of overall trips made by different means of transportation.

MPH - Miles per hour.

MSE Walls - Mechanically Stabilized Earth Walls.

MUTCD - The Manual on Uniform Traffic Control Devices.

MVO – Minimum valve opening.

NDCBU - Neighborhood Delivery and Collection Box Unit.

Outfall - The pipe that discharges completely treated wastewater into a lake, stream or river.

Passing Sight Distance - The minimum sight distance required for the driver of one vehicle to pass another vehicle safely and comfortably.

Pavement - The combination of gravel base, crushed rock, and asphalt concrete pavement placed on a subgrade to support the traffic load and distribute it to the subgrade.

Pavement Width - The distance measured from face of curb to face of curb for curbed sections of roadway or the distance measured from outside edge of shoulder to outside edge of shoulder for shouldered sections of roadway.

PC - Point of Curvature.

PCC - Portland Cement Concrete.

Peak-Hour - That period experiencing the highest volume of traffic.

Peak Period - Two hours during any a.m. or p.m. period when vehicle arrival and departure from the site or corridor is the highest.

Perimeter Streets – Public streets comprising the perimeter of a particular commercial/industrial development.

Permit - A document including any license, permit or franchise authorizing specified use of city right-of-way and granted under the authorization of the regulating agency.

Pipe - A structural tubular product designed, tested, and produced for the transmittance of specific liquids and gases under specific conditions.

PI - Point of Intersection.

Plowing - Direct burial of utility lines by means of a 'plow' type mechanism, which breaks the ground, places the utility line at a predetermined depth, and closes the break in the ground.

Posted Speed - Is the signed speed limit along a street.

Potable – Drinkable.

PRC - Point of reverse curvature.

Pressure - Internal gage pressure in a pipe in pounds per square inch, gage (psig).

Private Street - A privately owned and maintained access provided for by a tract, easement or other legal means.

Professional Engineer - An engineer licensed to practice in the State of Washington.

Professional Land Surveyor - A surveyor licensed to practice in the State of Washington.

Public Street – A publicly owned facility that provides access, including the roadway and all other improvements.

PT - Point of Tangency

Relocation - Planned change of location of an existing facility to a more advantageous place without changing the character or general physical nature of the facility.

Replacement - Installation of a like element of a utility system or subsystem in the same or near-same physical location normally due to damage, wear or obsolescence of the element.

Restoration - All work necessary to replace, repair or otherwise restore the right-of-way and all features contained within to the same or equal condition as before any change or construction thereto.

Retention Period - See "Detention Time."

Reviewing Agency - City of Auburn.

Restricted Access Point - A driveway or private street that connects to the general public street system, that turning movements are restricted to right in and out only.

Right-of-way (R/W) - All property in which the City has any form of ownership or title and which is held for public street purposes, regardless of whether or not any street exists thereon or whether or not it is used, improved, or maintained for public travel.

Riprap - Pieces of broken stone used to protect the sides of waterways from erosion.

Rural - All lands regardless of current comprehensive plan designation not meeting the definition of Urban.

Sand Trap - A section constructed deeper than the rest of the channel to allow sediment to settle out.

Separate Turn Lane - An auxiliary lane for traffic in one direction which has been physically separated from the intersection area by a traffic island or stripe. Separate turn lanes may be included within intersections or separated from intersection areas by traffic islands.

SF - Square Feet.

Shoulder - That portion of the roadway contiguous with the traveled way for accommodating stopped vehicles, for emergency use, and for lateral support of base and surface courses.

Single Main System - One main supplies both drinking water and firefighting water.

Single Occupancy Vehicle (SOV) - Automobiles transporting the driver only.

Slab - A cast concrete member of uniform thickness.

Standards – The City of Auburn Design Standards.

Stopping Sight Distance - The distance needed for a vehicle traveling at or near design speed to stop before reaching a stationary object in its path.

Street or Roadway - A public way, open for the passage of vehicles, persons and animals. Limits include the outside edge of sidewalks, or curbs and gutters, or side ditches, including the appertaining shoulder and all slopes, ditches, channels, waterways, and other features necessary for proper drainage and protection within the right-of-way.

Street Frontage - Any part of private or public property that borders a public street.

Street Tree - A tree placed within the public right-of-way.

Stub End Street - A dead end street that is planned to be extended and connected to future streets in an adjacent development. Depending on its length, it may or may not require a temporary cul-de-sac.

Substantial – In the sole opinion of the City Engineer, of ample or considerable amount, quantity, or size.

Subtended – To be opposite to and delimit <In a triangle, the hypotenuse *subtends* a right angle>.

Surface Retention - That part of a storm that does not immediately appear as infiltration or surface runoff. Retention is made up of depression storage, interception and evaporation.

Time of Concentration - The time required for water to flow from the most distant point on a runoff area to the measurement or collection point.

Traffic Control - Those activities necessary to safeguard the general public, as well as all workers, during the construction and maintenance of roadway and other facilities within the right-of-way.

Traveled Way - That portion of the roadway intended for the movement of vehicles, exclusive of shoulders.

Trenched - Installation of a utility in an open excavation.

Trip - A one-direction movement that begins at the origin and ends at the destination. For example, a trip movement from a residence to a work place is a trip from home to work.

Trip Generation - A general term describing the analysis and application of the relationships that exist between the trip makers, the traffic study area, and the trip making. It relates to the number of trip ends in any part of the traffic study area.

Uniform Flow - Flow that has a constant depth, volume, and shape along its course.

Unopened Right-of-way - A city right-of-way that exists by dedication or deed, but for which no vehicular roadway has been constructed by the city or other parties, and the street is not maintained by the city.

Unrestricted Access Point - A driveway or private street that connects to the general public street system, that has no limitations on turning movements. Left, right turns in and out are permissible.

Untrenched - Installation of a utility without breaking the ground or pavement surface such as by jacking or boring.

Utility - A company providing such public services as gas, electric power, telephone, water, sewer, or cable television, whether or not such company is privately owned or owned by a governmental entity.

Vent - Appurtenance to discharge gaseous contaminants from casings or other enclosures.

Wetpond – A stormwater pond that has been designed to retain a permanent pool of water “wetpool” to provide treatment of storm runoff.

Wetpool – The permanent pool of water retained in a wetpond or wetvault.

Wetvault – A stormwater vault that has been designed to retain a permanent pool of water “wetpool” to provide treatment of storm runoff.\

1.03 Preface

The City of Auburn has adopted this Engineering Design Standards manual to encourage the standardization of design elements for consistency and to assure that public safety needs are met. This manual contains engineering standards for use by professional civil engineers when designing facilities within the City of Auburn. The information contained in this manual cannot provide for all situations and conditions that may be encountered. Specific provisions contained within this manual may not be appropriate for all locations and existing conditions. These standards are intended to assist, but not substitute for, competent work by professional civil engineers.

The design requirements contained within this manual do not set legal standards of care, but provide guidance for possible engineering treatment under some circumstances.

This chapter contains general information on this manual and the City of Auburn.

1.04 Contact Information

Permit Center

Physical address:

Auburn Professional Plaza (2nd Floor)
One East Main Street

Mailing Address:

25 West Main Street
Auburn, Washington 98001-4998

Valley Regional Fire Authority

North Fire Station
1101 "D" Street NE
Auburn, Washington 98002-4016
Phone: (253) 288-5800
Fax: (253) 288-5900

CDPW - Engineering Services:

Phone: (253) 931-3010

Fax: (253) 931-3053

CDPW – Community Development:

Building Phone: (253) 931-3020

Planning Phone: (253) 931-3090

Fax: (253) 804-3114

1.05 Reference Material

1.05.1 City Reference Material

Unless noted otherwise, the reference material referred to herein may be obtained from the City of Auburn's website at:

http://www.auburnwa.gov/doing_business/public_works/publications_forms.htm

1.03.1.1 City of Auburn Surface Water Management Manual (SWMM)

The City of Auburn Surface Water Management Manual (SWMM) is the 2014 Department of Ecology Stormwater Management Manual for Western Washington (DOE SWMMWW) and City of Auburn Supplemental Manual. The SWMM is a manual of specific requirements related to storm drainage management.

1.05.1.2 City of Auburn Engineering Construction Standards Manual

The Engineering Construction Standards manual sets forth the standards used during the construction of all civil projects within the City's jurisdiction including the extension of public water, sanitary sewer, storm drainage, and transportation facilities by private developments. The manual is comprised of two sections. Section I contains the City's Standard Special Provisions and Section II contains the City's Standard Details. The Standard Special Provisions are a supplement to, and a modification of, the "Washington State Department of Transportation (WSDOT/APWA) Standard Specifications for Road, Bridge and Municipal Construction,". The Standard Details are comprised of the City's construction and design detail drawings for temporary erosion control, grading, water, sanitary sewer, storm drainage, and street work within the City that are supplemented by the "Washington State Department of Transportation's (WSDOT) Standard Plans."

Standard Details as referenced herein refer to the current City of Auburn Standard Details included in the City of Auburn Engineering Construction Standards – Part 2, Standard Details. WSDOT Standard Plans as referenced herein refer to current WSDOT Standard Plans. The referenced details and plans shall be the standard except as modified by Part 1 (Special Provisions) of the Engineering Construction Standards and by this document (City of Auburn Engineering Design Standards).

1.05.1.3 Planning Documents

Auburn Comprehensive Plan

Transportation Improvement Program

Comprehensive Transportation Plan

Comprehensive Sewer Plan
Comprehensive Water Plan
Volume I Report
Volume II Appendices
Comprehensive Storm Drainage Plan

1.05.1.4 Informational Handouts

The following Handouts are currently available from the City to aid the public in planning and constructing development projects within the City of Auburn. Contact the Permit Center for the most current list available.

Deviation Process
Downtown Auburn Sidewalk Design Guidelines
Civil Site Improvement Submittal Packet (FAC and GRA)
Half-Street Requirements Summary
Hydrant Meter Permit Regulations
Median Design and Maintenance Guidelines
Park Impact Fees
Payback Requirements
Public Facilities Extension (FAC) Summary
Handout for Single Family Residential Drainage Systems
School Impact Fees
Site Access Requirements
Temporary Erosion & Sediment Control (TESC) for Small Sites
Transportation Impact Fees
Truck Impact Fees
Utility Connection Fees

1.05.1.5 Technical Memos

These handouts contain information that are subject to change or are too specific to be included in this manual:

- Sanitary Sewer Pump Station Requirements and Standards.

1.05.2 Other Reference Material

The following publications should be used as additional reference material for design applications not covered by the City's publications and can typically be found on the publishing agency's website:

- A. City of Auburn Code related to development requirements.

- B. Washington State Department of Transportation (WSDOT) "Standard Specifications for Street, Bridge and Municipal Construction" as amended by the City's Construction Standards Section I. These will be referred to in City publications as the "WSDOT Standard Specifications."
- C. Washington State Department of Transportation (WSDOT) "Design Manual" (latest edition).
- D. American Association of State Highway and Transportation Officials' (AASHTO) "A Policy on Geometric Design of Highways and Streets" (latest edition).
- E. State of Washington Department of Ecology's "Criteria for Sewage Works Design" (latest edition).
- F. State of Washington Department of Health (DOH) "Water Systems Design Manual" (latest edition).
- G. American Water Works Association (AWWA) Standard Specifications (latest edition).
- H. "IES Lighting Handbook" (Illuminating Engineering Society of North America) (latest edition).
- I. American National Standard for Roadway Lighting ANSI/IESNA RP-8-00 (latest edition).

1.06 Deviation from Standards

The engineering design standards contained herein shall be used when designing a development project within the City of Auburn. In special cases, City standards may not best address a particular engineering application. In these instances, a design deviation from the City's standards may be requested from the City Engineer. All such requests shall be made using the City's Deviation Request Application and include applicable engineering justification for the deviation. Deviation requests and supporting justification must be sealed by a licensed professional civil engineer. The City Engineer will evaluate the request and notify the applicant of his/her decision within fifteen (15) working days of the receipt of a complete deviation request or with the completion of the first review of the development review plans or plats (for Short Plats, Plats, FAC's and Grading Permits), whichever is later. Approved deviations must be shown on the final plans as specified in Chapter 3. The following deviations may be obtained from the City of Auburn.

1.06.1 General Deviations

General deviations apply to all engineering design standards except for the Surface Water Management Manual's Minimum Requirement deviations.

The engineering design deviation when compelling supporting justification shall clearly demonstrate that the proposed deviation will meet or exceed the corresponding City standard for the following applicable criteria:

- A. The functional intent of the design element.
- B. Safety factors associated with the design element.
- C. Operational concerns associated with the design element.
- D. Maintenance concerns associated with the design element.
- E. Liability concerns associated with the design element.

- F. The capacity and/or efficiency of the design element.
- G. The design life, historical performance, and durability of the design element.
- H. The aesthetic and visual impacts of the design element.
- I. The cost effectiveness and availability of any replacement components or materials.
- J. Consistency with the spirit and purpose of the corresponding City design standard.
- K. Demonstration that the environment will not be adversely affected.
- L. Supported by published industry standards.
- M. The effect on buildable lands within the City of Auburn.

1.06.2 Surface Water Management Manual (SWMM) Deviations

1.06.2.2 The Ten Minimum Requirements

A deviation request from any of the ten minimum requirements in the SWMM goes through a different process which includes a public notice requirement. This is to insure that the Department of Ecology mandated surface water regulations are complied with. The ten Minimum Requirements of the SWMM are as follows:

1. Stormwater Site Plan
2. Construction Stormwater Pollution Prevention Plan
3. Source Control of Pollution
4. Preservation of Natural Drainage Systems
5. On-site Stormwater Management/ Low Impact Development
6. Runoff Treatment
7. Flow Control
8. Wetlands Protection
9. Operation and Maintenance
10. Off-site Analysis and Mitigation

1.06.2.3 Deviation Process

Requests for deviations from the ten Minimum Requirements of the SWMM shall be in accordance with ACC 13.48.226 and these standards.

1.07 Appeal of City Engineer's Decision

Appeal of the City Engineer's decision shall follow the following procedure:

The applicant shall have fifteen (15) working days from the date of receipt of the City Engineer's decision in which to submit a written notice to the Community Development & Public Works Director contesting the written decision of the City Engineer. The Director shall then have fifteen (15) working days to notify the applicant of his/her decision to uphold or modify the City Engineer's decision. For engineering deviations requests, the City Engineer's determination shall be final.

If the Community Development & Public Works Director determines the nature of the deviation requires a non-engineering policy decision by the Auburn City Council, the Community Development & Public Works Director shall seek such decision from the Auburn City Council at the next available meeting. The Community Development & Public Works Director shall notify the applicant within five (5) working days after the Auburn City Council's decision.

1.08 Changes to Standards

The City of Auburn's City Engineer is authorized to make any additions, deletions, or modifications stated in these Standards. (ACC 12.04.010)

Chapter 2 Plan Approval Process

2.00 Preface

This chapter contains standards and procedures that apply to the review and approval process for civil engineering plans. Development or redevelopment of property within the City of Auburn, and/or within the limits of Auburn's Utility Service Area, that require civil engineered plans to support a development action must follow the processes outlined below.

2.01 Types of Plans

This section contains information regarding the types of civil engineering plans submitted to the City. Specific plan requirements are described in detail in Chapter 3.

Civil engineering plans submitted to the City for review fall within the following four categories.

2.02 Grading Plans

Grading plans are required prior to the issuance of a Grading Permit and before commencement of construction in the following situations:

- A. Any application made for a Grading Permit that includes excavations and/or fills exceeding five hundred cubic yards (500 yd³) of material.
- B. An application made for a Building Permit for all new non-residential developments and residential construction of three units or more per lot.
- C. An application made for a Land Clearing Permit when the proposed work involves temporary roads and leveling of the site.
- D. An application made for construction of a parking lot.
- E. An application made for a plat or a short plat that requires grading on the site resulting in the movement of over five hundred cubic yards (500 yd³) of material.
- F. An application made for a plat, short plat or new non-residential development that adds or replaces 2,000 square feet or more of hard surfaces or disturbs more than 7,000 square feet of land disturbance.

2.02.1 Building Site Plans

A Building Site Plan includes all civil site development requirements including site layout, site access, parking, utility service, and storm drainage control. An approved Site Plan is required prior to the issuance of a Building Permit and before commencement of construction.

Building Site Plans are required for the following situations:

- A. A Building Site Plan along with a Grading Plan is required in association with a Building Permit application for all new non-residential developments and residential construction of three (3) units or more per lot.
- B. Where an existing site is redeveloped such that new buildings and additions and/or alterations to existing buildings increase the assessed value of the improvements on the property by greater than fifty percent (50%), and the new plus replaced hard surface is five thousand square feet (5000 ft²) or more.

- C. Alteration of site access requirements, and/or connect to and impact City streets and utilities.
- D. Convert $\frac{3}{4}$ acres or more of native vegetation to lawn/landscaped area or convert 2.5 acres or more of native vegetation to pasture.
- E. The Change of Use of an existing site requires one or more of the following.
 - 1. The installation of onsite parking resulting in the addition of over five thousand square feet (5000 ft²) of hard surface area.
 - 2. The alteration of the access to and from City streets including adding or removing driveways.
 - 3. The installation of a new storm system to serve hard surface area of over five thousand square feet (5000 ft²) of hard surface area.
 - 4. The installation of code-required landscaping. (This will require the submittal of a landscape plan for review and approval by the City of Auburn Planning Department).

One example is the conversion of a residential property to a commercial use. The work covered by the Building Site Plan may include the building and grading work; however, the applicant must make separate applications for a Building Permit and a Grading Permit.

2.02.2 Public Facility Extension (FAC) Plans

An approved Public Facilities Extension Plan (FAC Plan) is required prior to installing new or improving existing public sanitary sewer, water, storm drainage, and/or transportation facilities.

FAC Plans are required in the following situations:

- A. With a Building Site Plan when construction of the building requires the extension of a City water, sanitary sewer, or storm drainage facility.
- B. With a Building Site Plan when construction of the building requires improvements to the City transportation facility.
- C. With a Grading Plan for public utility improvements within Plat and Short Plats.
- D. For county projects where water and sanitary sewer mains within Auburn's Utility Service Area are extended.

Prior to preparing plans for submittal, the applicant should obtain a "Developer Public Facility Extension Process Summary" from the City. This summary explains some of the basic requirements and steps of the FAC process.

2.02.3 Other Plans

Some projects may also require other types of plans. The requirements for these additional plans will usually be addressed early in the submittal process. These plans could include, but are not limited to, the following:

- A. Landscape plans.
- B. Land clearing plans.
- C. Irrigation plans.
- D. Wetland plans.

2.03 Review and Approval Process

2.03.1 Submittals

When submitting civil engineering plans to the City for review, the following steps should be taken to insure a complete submittal and timely approval of civil engineering plans:

- A. Applicants are encouraged to meet with City staff prior to plan submittal. (Pre-application information is available through the City of Auburn) All plans and associated documents submitted to the City will be assigned a permit number and receive a preliminary review to make sure that they adequately address the minimum requirements of a complete application. Any such plans and associated documents not meeting these requirements will be returned to the applicant or his designee as unacceptable for review, with a written explanation of necessary corrections required prior to the subsequent resubmission.
- B. Prior to preparing civil engineering plans for submittal, the applicant should obtain a Civil Site Improvement Submittal Packet from the City, for the appropriate type of plans. This packet contains information necessary to prepare plans in conformance with City guidelines. The checklists within the Civil Site Improvement Submittal Packet shall be completed and submitted along with the civil engineering plans.
- C. Civil Engineering plans and associated documents are to be submitted to the City for processing.
- D. After the receipt of a completed Civil Site Improvement Application and application fees, the City will make a preliminary review of the plans and supporting data to verify the scope of the proposed extension(s) and check for completeness of the application. The City requires a minimum of 10 working days from the date of initial submittal to determine if the application is complete. Once the City is satisfied with the completeness of the application and has verified the length of the extension(s), a letter will be sent requesting that the following be submitted before any detailed FAC Plan review work will be performed:
 1. An executed Facility Extension Agreement.
 2. Forty percent (40%) of the total calculated Facility Extension fee. (The remaining sixty percent (60%) will be due prior to construction.)
- E. The following number of documents and plans are required for a complete submittal:

	Plan Sets	Plan Submittal Packet	Stormwater Site Plans	Geo-Technical Reports
Grading Plans	2	1	1	1
Building Site Plans	2	1	1	1
FAC Plans	2	1	1	1

- F. All Plans submitted to the City shall be non-ammonia based prints and electronic files of all the submittal documents shall be provided in the formats specified herein.
- G. All proposed public right-of-way dedications and easements not under the ownership of the applicant shall be dedicated to the City prior to final plan approval

with the exception of plats and short plats. A title report will be required to confirm property ownership.

- H. The following applicable information may be required along with the plan submittal:
 - 1. Title report (required if right-of-way is being dedicated).
 - 2. The final biologist report, including the wetland mitigation plan when appropriate.
 - 3. Traffic reports.
 - 4. A copy of the final SEPA determination (for projects where the City isn't the lead agency).
 - 5. A copy of other applicable applications (Short Subdivisions, Subdivisions, etc.).
 - 6. Letter indicating how SEPA and/or other applicable application conditions have been accounted for in the development/plan process.
- I. All plans, calculations, or reports submitted for review shall be stamped by a Washington State licensed professional civil engineer (PE). Polypro plans, calculations, and reports submitted for final approval need to have the PE stamp wet signed and dated in permanent ink.
- J. Where the plan review process is running concurrent with other applications (SEPA, Subdivisions, etc.), the above-referenced information may not be available at time of plan submittal. In such instances, other required applications shall be provided prior to final plan approval.

2.03.2 City Review

The City will review plans and associated calculations and reports for conformance with City development requirements, standards, and policies. Red-line construction drawings, calculations, reports, and written plan review comments will be returned to the applicant's designated contact person for revisions. The applicant's engineer shall revise construction drawings, calculations, or reports to address City plan review comments and provide comprehensive comment responses with the updated documents. The revised drawings (the required number will be determined by the City) and associated calculations and reports along with the redline comments shall be resubmitted to the City for additional review.

2.03.3 Plan Approval

Once the plan review process is completed and all City review comments have been addressed, the City will request that one copy of sealed plans be submitted for approval.

- A. Final reproducible plans shall be placed on a minimum 8-mil water resistant matte polypropylene (Polypro) or approved equal and will be signed by the City Engineer or his designate and shall remain on file with the City. (Note: No Xerox, sepia, or toner printed mylars are allowed). Upon approval, the developer will be required to check out these Polypro plans from the City and make the required number (6 to 18 sets) of prints for the City, plus any required for themselves or the contractors, prior to issuance of any construction permits.
- B. All applicable AutoCAD files shall be submitted to the City on a compact disk or flash drive along with the Polypro for integration into the City's Geographic

Information System (GIS). For more information on AutoCAD file submittal, please obtain a copy of the City's "Record Construction Document Packet."

- C. If after plan approval but prior to construction the applicant chooses to make changes to the approved plans, a revised plan reflecting such changes may be required if the City determines the changes will impact the City's ability to insure construction is completed in conformance with City regulations. In such cases, the revised plans shall be submitted to the City for review and a new revised Polypro shall be provided for approval with the changes shown, sealed by the design engineer, and approved by the City.

2.03.4 Project Close Out

The following is the basic process required for accepting construction completion on a project:

- A. After completion of construction, a paper plan copy of the approved plan set shall be utilized for a dry run "as-built" set prior to redlining the original Polypro set. A copy of the "Record Construction Document Packet" which outlines the complete record drawing process in detail can be obtained from the City.
- B. All changes to the approved plan noted by the contractor and/or surveyor during the construction process shall be clearly indicated on the paper copy of the approved plan in red ink.
- C. The "Record Drawing Certification" block on all sheets of the as-built paper set shall be signed and dated by the Engineer or Surveyor making the corrections and the plan set returned to the City for verification by the City prior to these changes being made to the original Polypro set..
- D. After approval of the redlined paper plan copy of the original approved plan set, the approved original Polypro plans shall be checked out from the City, and the approved corrections shown on the approved "as-built" paper plan set shall be made on the original Polypro plans in red ink. These record drawings will become final once the City has verified the corrections are consistent with the approved paper set. Finalized record drawings are required before the project will be accepted.
- E. A final stormwater site plan with letter shall be submitted by the Engineer of Record to the City verifying that the storm facilities were installed as designed.
- F. Electronic copy of the Stormwater Site Plan and Geotechnical Report.

The following documents shall also be completed for projects prior to project close out.

- A. All legal documents, including but not limited to a Bill of Sale and Utility Easements, shall be updated as needed and executed.
- B. A "Developers Contribution Document" shall be obtained from the City and completed, if applicable.
- C. All Maintenance Bonds or Assignments of Funds for the one-year maintenance period shall be in place.

Chapter 3 Plan Preparation Requirements

3.00 Preface

This chapter describes how civil engineering plans should be laid out to meet City requirements and provide a format that is easy to follow and understand. Civil engineering plans need to meet these basic standards in order to move through the review process in an efficient manner.

3.01 General Requirements

The following general requirements shall be taken into account when preparing civil engineering plans for review and approval by the City:

- A. The general construction requirements for the City of Auburn shall be those contained in the City of Auburn's current Engineering Construction Standards Manual which supplements or modifies the "Washington State Department of Transportation (WSDOT) Standard Specifications for Road, Bridge and Municipal Construction," except where supplemented or modified by the City in this manual.
- B. The civil engineering plans shall reference City Standard Specifications, Standard Details, and WSDOT Standard Plans as necessary. The City's Standard Specifications and Standard Details are contained in the Engineering Construction Standards, a copy of which shall be on-site during construction.
- C. All civil engineering plans and reports shall be prepared and sealed by a Washington State licensed professional civil engineer.
- D. Property surveys shall be performed and sealed by a Washington State licensed professional land surveyor and be tied to the current City datum (NAVD 88) and horizontal control datum shall be NAD83 (1991) as officially adjusted and published by the National Geodetic Survey. (WAC 332-160-060 and RCW 58.20). A list of City Benchmarks is available upon request.
- E. All civil engineering plans and calculations shall be neat, uncluttered, legible, and in conformance with the requirements herein. The City requires that all plans be prepared utilizing AutoCAD software.
- F. Where applicable, shop drawings shall be submitted for review and approval prior to construction.
- G. All deviations from City's Engineering Design and Construction Standards must be shown on the plans with a note call-out and description that references the City assigned deviation number and deviation approval date. The format of these call-outs and note descriptions shall be as shown in Appendix C of this Chapter.

3.02 Plan Format

The City requires that plan sets be submitted in an order consistent with this section. Depending on the complexity or simplicity of the project, the amount of detail and content required will be subject to change.

3.02.1 Grading Plans

Grading plans shall consist of the following sheets:

- A. Cover sheet (See 3.04.1).
- B. Temporary Erosion and Sediment Control (TESC)/Demo Sheet (Land Clearing when applicable) (See 3.04.2).
- C. Grading Plan (See 3.04.3).
- D. Cross-Sections (See 3.04.4).
- E. Details (See 3.04.5).

3.02.2 Building Site Plans

Building Site Plans shall consist of the following sheets:

- A. Cover Sheet (See 3.04.1).
- B. Temporary Erosion and Sediment Control (TESC)/Demo Sheet (Land Clearing when applicable) (See 3.04.2).
- C. Public Storm Drainage Plan (See 3.04.6).
- D. Utility Plan (See 3.04.7).
- E. Cross-Sections (See 3.04.8).
- F. Details (See 3.04.5).
- G. Landscape Plan (See 3.04.10).
- H. Irrigation Plan (See 3.04.11).

If a separate associated grading plan has been submitted and approved, those areas covered under the grading plans will not need to be readdressed in the building site plans.

3.02.3 Facility Extension (FAC) Plans

These plans will be required whenever public streets, sanitary sewer, storm drainage, and/or water lines are being extended or modified. The FAC portion of a plan set could consist of the following sheets:

- A. Cover Sheet (See 3.04.1).
- B. Temporary Erosion and Sediment Control (TESC)/Demo Sheet (Land Clearing when applicable) (See 3.04.2).
- C. Utility Plan and Profiles (See 3.04.7 & 3.04.8).
- D. Street and/or Storm Plan and Profiles (See 3.04.8 & 3.04.9).
- E. Street Cross-Sections and Additional Street Elements (See 3.04.9).
- F. Details (See 3.04.5).
- G. Street and/or Site Landscape Plans (See 3.04.10).

FAC plans may also contain information normally associated with either a grading or a building site plan.

3.03 General Plan Requirements

3.03.1 Standard Plan Format

Applicable information in this section shall be shown on the plan set.

- A. Each sheet of the plan set shall be stamped by a professional engineer licensed in the State of Washington. The stamp/seal on the final Polypros, to be submitted for approval, shall be wet signed and dated per WAC 196-23.
- B. North arrow and plan alignment shall be to the top, right, or left.
- C. A title block shall be provided along the right-hand edge on each plan sheet. The title block shall include the development title (in bold print), the name, address and phone number of the firm preparing the plan and the owner/developer, a revision block (showing the date of the latest revision), page of pages numbering, and sheet title (e.g., road and storm drainage, grading, erosion/sedimentation control, water and sanitary sewer).
- D. Indicate units of measurement for all slope callouts as either percent (%) or feet per foot (ft./ft.). Do not mix units of measurement on a plan set.
- E. Provide all match lines with matched sheet numbers (stationing).
- F. The street classification shall be provided under the street name on all plan views.
- G. A City of Auburn approval block (4"x2") on each plan sheet shall be provided in lower right corner of each plan sheet. Show project reference numbers (BLD for Building Permit, FAC for Public Facility Extension Plan, LND for Land Clearing Permit, STM for Storm Permit and/or GRA for Grading/Erosion Control Permit) in the approval block area. A blank Auburn Engineering approval block is shown as block B-1 in Appendix A of this chapter.
- H. A sign-off block (4"x2") on each plan sheet shall be provided for Record Drawing certification, located directly to the left or directly above the approval block. A blank Record Drawing Certification block is shown as block B-4 in Appendix A of this chapter.

The locations of the title blocks, approval blocks, and engineering stamp shall remain consistent throughout all the plan sheets.

3.03.2 Drafting Standards

Drafting requirements are as follows:

- A. Plan sheets shall be printed on 24"x36" size paper. Any variation must be approved by the City prior to plan submittal. Approved plans shall be produced per Section 2.02.3 of the Engineering Design Standards. Margins shall be set to provide for ½ size drawings to fit on 11"x 17" sheet size.
- B. Lettering size shall be no smaller than one tenth (1/10) of an inch in height and shall be uppercase. Callouts and other information shall be printed horizontally in most cases.
- C. Existing features shall be shown with dashed lines and/or toned back (screening 45%).
- D. Proposed features shall be shown with solid lines. The intent is to clearly distinguish existing features from proposed improvements.

E. Minimum scale shall be:

1. Site work: 1" = 40' horizontal.
2. Public facility work: 1" = 20' horizontal.

Vertical scales should typically be 1/10th the horizontal scale. For public facility work in areas with steep slopes, 1" = 5' may be used in place of 1" = 2'.

Use a scale that best utilizes paper space and gives the best overall view of the site.

F. Use APWA AutoCAD symbols in the legend to identify both existing and proposed improvements and utilities.

3.04 Plan Sheet Elements

The following section covers the basic elements that are required to be shown on the different plan sheets. While all plan sets will have a cover sheet, there are other sheets covered here that may or may not be included in a particular projects plan set.

3.04.1 Cover Sheet

The Title sheet(s) shall incorporate all the requirements listed in Section 3.02, plus the following applicable items:

- A. A general scaled site plan covering an area approximately ten inches (10") square.
- B. Vicinity map (approximate scale) with north arrow covering an area approximately five inches (5") square.
- C. Site address.
- D. Owner/Applicant, address, contact, and phone number.
- E. Engineer/Surveyor/Architect address, contact, and phone number.
- F. Elevations with City datum (NAVD 88) tied to City benchmarks with reference to the benchmarks' numbers and locations indicated.
- G. The permit number in one-inch (1") bold lettering shall be above the title block (located on the right side of the sheet) on the cover sheet only.
- H. Sheet Index.
- I. Legend.
- J. Full legal description(s) including quarter section, section, township, and range.
- K. Parcel number(s).
- L. Site zoning and adjacent zoning (may be shown on a separate vicinity map sheet).
- M. Applicable plat name and lot numbers.
- N. Applicable site information including the number of parking spaces required and the number of parking spaces provided.
- O. Type of building construction as defined by the adopted Building Code.
- P. Site access including adjacent driveways, roadways, and intersections that may have an impact on the location and type of site access.
- Q. An overall site plan key map shall be shown if the plan set includes more than five (5) plan sheets, unless otherwise directed by the city.

- R. Construction Sequence outlining a basic construction schedule. (See Section 5.05)
In addition, depending upon the nature of the project, the construction of some public facilities may also dictate separate construction sequencing requirements that will also need to be indicated on the plans.
- S. The City of Auburn General Notes as shown in Appendix B of this chapter.
- T. Provide a list of the additional non-building permits required for this project.
- U. Indicate approximate fill and excavation quantities in cubic yards.

3.04.2 Temporary Erosion and Sediment Control (TESC) Plan Sheet

TESC design shall be in accordance with Chapter 5 – TESC, Clearing, and Grading, and include the following applicable items:

- A. Marked clearing work limits, environmentally sensitive areas and their buffers, and trees that are to remain.
- B. Indicate the location of the construction entrance
- C. Provide the onsite stormwater facilities during construction.
- D. Indicate the minimum temporary erosion control measures to be used on the site during construction, this may include, silt fencing, interceptor ditches, detention or retention facilities, flow control structures, etc.
- E. Show containment locations for storing pollutants, including waste materials and demolition debris, prior to their removal from site.
- F. In the construction sequence, provide a phasing schedule for installing and removing TESC BMPs, including the transition from the temporary storm drainage system to the permanent storm drainage system.
- G. All existing site features and conditions shall be shown on this sheet including the existing topography.
- H. This sheet may also function as a demolition site plan and should indicate all existing features and structures to be removed/demolished and those that will remain.
- I. Provide the Auburn Grading and Erosion Control Notes as shown in Appendix B of this chapter.

3.04.3 Grading and Private Storm Drainage Plan Sheet

The Grading design shall be in accordance with Chapter 5 – TESC, Clearing, and Grading, and include the following applicable items:

- A. Indicate slope of any fill or cut slopes.
- B. Show type of fill material and associated compaction requirements.
- C. Show existing significant trees (six inches (6") in diameter and larger for evergreens and four inches (4") in diameter or larger for deciduous). Indicate if tree is to either be retained or removed. Note that a land-clearing permit may be required.
- D. Provide temporary storm drainage retention or detention facilities including City control structure, water surface (W.S.) elevations, seasonal high groundwater elevation, orifice sizes, design storms for the W.S. elevations, and release rates.

- E. Show horizontal setback between the bottom of any fill placement and the top of the bank of a defined drainage channel per requirements noted in section 5.03.3.
- F. Show typical ditch sections.
- G. Show connections of building roof and foundation drains to the site drainage system.
- H. Show the existing topography shaded back and overlaid by the proposed grades.
- I. Show existing and finished elevations and contours. Spot elevations may be required for relatively flat sites to supplement the contour elevations as necessary to adequately reflect existing and finish grades. Provide spot elevations along property line and a minimum of thirty feet (30') beyond property line (at least fifty foot (50') intervals).
- J. Reference standard City of Auburn Detail Numbers appropriately. If a project specifies modification to a Standard Detail a new detail must be shown on the plans.
- K. Provide notes to protect and maintain erosion control facilities during grading operations.
- L. Provide arrows to indicate drainage flow direction on paved surfaces.
- M. Show layout of the entire storm drainage pipe with length, slope, and material type labeled and direction of flow indicated.
- N. Provide site specific details and cross-section sheets for storm drainage detention or retention facilities.
- O. Indicate the emergency overflow to the public storm system.
- P. Show berm dimensions, materials, compaction requirements for ditches and detention ponds where applicable.
- Q. Show locations of manholes and catch basins, indicating type, stationing, offset, lid type, rim and invert elevations. Number manholes and catch basins consecutively.
- R. Show existing and proposed sanitary sewers and water mains (use ghost lines), identifying crossing and minimum vertical distance between utilities.
- S. Provide type of material and size of energy dissipaters (riprap, etc.).
- T. Provide details of all low impact development and storm water quality control facilities.
- U. Provide limits of surface water ponding in parking lots.
- V. Show trash racks, if applicable.
- W. Show locations, widths and types of easements.
- X. Show locations and types of pumps, if applicable.
- Y. Show water quality facilities locations, lengths, widths, slopes, and cross-sections.
- Z. Provide planting and seeding requirements with establishment procedure in construction sequence for water quantity and quality systems.
- AA. Show finish floor elevations.
- BB. Show the controlling downstream storm drainage elevations including the associated design conditions.
- CC. Address other agency permit requirements, as necessary.

DD. For ponds, provide: aesthetics, fencing, power (if applicable), maintenance access, control structure, critical water surface elevations, and other items, such as walls and liners.

EE. Address bypass surface flows.

FF. Address subsurface flows and indicate water surface elevations.

GG. Clearly indicate private drainage facilities on the plans. Justification is needed for any facility proposed to be a joint public and private facility, for City consideration.

Some projects may be able to combine the grading sheet with the erosion control and demo plan depending on the complexity of the project.

3.04.4 Cross-Section Sheet

The Cross-Section plan sheet(s) shall have the following applicable items:

- A. Cross-sections for fill and grading shall be shown through all properties to at least thirty feet (30') beyond the property lines. Adequate cross-sections shall be shown to represent the site. At a minimum this shall include one shown in the north direction (west-east from left to right) and one shown in the east direction (south-north from left to right) cross-section.
- B. This sheet may also contain cross-sections for the temporary storm drainage pond.
- C. The scale used for the site cross-sections on this sheet should match the scale on the other sheets.

Some projects may be able to combine the cross-section sheet with the grading sheet depending on the complexity of the project.

3.04.5 Detail Sheet

The Detail sheet(s) shall have the following applicable items:

- A. Any detail that is specific to this project.
- B. City Standard Details should not be shown on this sheet unless they need to be modified for a project specific application.
- C. Storm control manholes are normally shown on this sheet.
- D. This sheet may also contain cross-sections for the temporary storm pond.

City Standard Details should be called out on the applicable plan sheet using the detail number.

3.04.6 Public Storm Drainage Plan Sheet

Grading and Storm Drainage system design shall be in accordance with Chapter 5 – TESC, Clearing, and Grading, and Chapter 6 – Storm Drainage Facilities (which incorporates by reference the SWMM), and include the following applicable items:

- A. The layout of all the storm drainage pipes with the length, slope, and material type indicated in the labeling of the storm drainage pipes. Provide arrows to indicate the direction of flow into the structures.
- B. Typical ditch section.

- C. Location of manholes and catch basins. Indicate type, stationing, offset, rim and invert elevations, and number manholes and catch basins consecutively.
- D. Existing and proposed sanitary sewers and water mains (use ghost lines). Identify crossings and minimum distance between utilities.
- E. Building downspouts or footing drain locations, inverts and connections to the storm drain system.
- F. For single-family home sites, indicate means for collection and discharge of water from roof, foundation drains, and driveways.
- G. Provide arrows to indicate drainage direction in parking lots, roadway intersections and cul-de-sacs.
- H. Reference to the detail/BMP and/or cross-section sheets for storm drainage detention or retention facilities such as the control discharge structure and pond cross-sections. Indicate water surface elevations, allowable discharge rates, and design storms.
- I. Show an emergency overflow to the public storm drainage system.
- J. Berm dimensions, material, and compaction requirements for ditches and detention ponds where applicable.
- K. Indicate type of material and size of energy dissipaters (riprap, etc.).
- L. Provide details of the storm drainage water quality facility.
- M. Limits of surface water ponding within parking lots.
- N. Trash racks as applicable.
- O. Location and widths of easements.
- P. Location and type of pumps, if applicable.
- Q. Stormwater treatment/quality control facility location, length, width, slopes, and cross-section.
- R. Planting and seeding requirements with establishment procedure (construction sequence) for water quantity or quality systems.
- S. Finish floor elevations of all buildings.
- T. Indicate separation from any pipe, infiltration trench, open ditch, and bioswale to any property line or obstruction.
- U. Address other agency permit requirements, as necessary.
- V. For ponds, provide: landscaping, fencing, aeration, maintenance access, critical water surface elevations, and other items, such as walls and liners.
- W. Number the storm drain structures. (Numbers will be provided by the City prior to final plan approval.)
- X. Indicate any required easements including their dimensions.
- Y. Low Impact Development (LID) facility location, length, width, slopes, and cross-section.

3.04.7 Utility Plan Sheet

The plan set shall include an overall utility plan sheet that shows the private connections to the public water and sanitary sewer systems and any required extensions of the public water and sanitary sewer systems. The more detailed Utility sheet(s) shall have the following applicable items:

3.04.7.1 Water

Water system design shall be in accordance with Chapter 7 – Water Facilities, and include the following items:

- A. Water pipe and fitting size, location, and type of material.
- B. Details of connections to existing water mains.
- C. Valve size, locations and type.
- D. Fire hydrants locations.
- E. Air vac/blow-off locations.
- F. Pressure reducing stations and associated valves, vaults and by-pass piping as required.
- G. Concrete blocking, mechanical, or restrained joint pipe support.
- H. Watermain, water meter, and fire hydrant easements.
- I. Meter size and service line size and location.
- J. Irrigation meter size and service line size location.
- K. Proposed fire line, FDC line and PIV locations.
- L. Backflow prevention assembly and detector check meter size, type and location.
- M. For buildings requiring fire sprinklers, the fire sprinkler notes shall be shown on the plan, as shown in Appendix B of this chapter.
- N. Table showing physical separation in feet between water lines and other utilities at crossings, when a profile is not required.
- O. Cross connection control notes included in Appendix B of this Chapter 3.
- P. For plat or road projects provide unique stationing down the center of the road with the appropriate off-set at all water main appurtenances. For all other projects provide unique stationing down the center of the water main.

3.04.7.2 Sanitary Sewer

Sanitary sewer system design shall be in accordance with Chapter 8 – Sanitary Sewer Facilities, and include the following items:

- A. Sanitary sewer pipe size, locations, type of material, and stationing.
- B. Location of manholes. Indicate type of manhole, stationing, offset, and number manholes consecutively. During the City review process, manhole numbers shall be assigned by the City to be incorporated into the next submittal.

- C. Indicate knockouts in manholes for future connections.
- D. The direction of sewage flow shall be indicated with an arrow at the manhole. Proposed sewer shall have solid arrowheads while existing pipe and manholes shall be shown in ghost or screened lines with the arrowhead and manhole not filled.
- E. Drop manholes, if approved, are to be detailed on the plans.
- F. Length, slope, type and class of material, and inverts for side sewers.
- G. Stationing for side sewers from downstream manholes.
- H. Connection of a side sewer to the City's sanitary sewer pipe shall be indicated with a tee.
- I. Locations of sanitary sewer cleanouts.
- J. Locations of sanitary sewer easements.
- K. Clearly define right-of-way and adjacent property lines. Parcel numbers for all lots adjacent to the improvements shall be indicated.
- L. Floor drains, drains from other covered areas potentially subject to pollutants, and wash areas within parking lots shall be connected to the sanitary sewer through an approved oil/water separator.

3.04.8 Utility Profile Sheet

The Utility Profiles should be included on the associated utility plan sheet with plan view above the profile view and corresponding unique stationing.

3.04.8.1 Storm Drainage

For complex private storm systems and all public storm lines, a profile will be required. These profiles should include the following items where applicable:

- A. Public storm drainage located within the street right-of-way shall be shown on the street profile. See Section 3.04.9.2
- B. Public storm drainage located in an easement shall have separate profiles.
- C. Structure size, location, type, station, invert elevation, type of lid or grate, and rim elevation.
- D. Pipe size, type of material, slope (ft./ft.), and lineal footage.
- E. Utility crossings shall identify size and type of utilities involved.
- F. Ditches where applicable, size, type and slope.
- G. Existing and finished grade along pipe centerline.
- H. Connections to existing structures.

3.04.8.2 Water

Profiles shall be provided for all public water systems, including on-site systems and systems within the street/City right of way and easements. These profiles shall include the following items:

- A. Water line located within the street right-of-way shall be shown on the street profile. See Section 3.04.9.2.
- B. Water line profiles are not generally required for lines located in easements unless there are utility conflicts.
- C. Pipe size, type of material, lineal footage, cover and stationing.
- D. Utility crossings shall identify size and type of utility involved.
- E. Existing and finished grade along pipe centerline.
- F. Connections to existing mains and fittings.
- G. Label fittings and valves include blocking.

3.04.8.3 Sanitary Sewer

A profile will be required for all public sanitary sewer mains. These profiles should include the following items where applicable.

- A. Sanitary sewer located within the street right-of-way shall be shown on the street profile. See Section 3.04.9.2
- C. Structure size, location, type, station, invert elevations, type of lid, and rim elevation.
- D. Pipe size, type of material, slope (ft./ft.), and lineal footage.
- E. Utility crossings shall identify size and type of utility involved.
- F. Existing and finished grade along pipe centerline.
- G. Connections to existing structures.
- H. Side sewer locations and stationing.

3.04.9 Public Street Plan and Profile Sheet

Whenever a project includes construction within a public street excluding utility connections, both a plan and a profile shall be included in the plan set. The Public Street Plan and Profile sheet(s), when required, shall have the following applicable items:

3.04.9.1 Plan View

The plan view should include the following items where applicable:

- A. Plan views shall be drawn at a 1" = 20' scale.
- B. Existing and proposed rights-of-way.
- C. Existing and proposed contours and elevations.
- D. Existing and proposed street names.
- E. Existing and proposed centerline bearings.
- F. Existing and proposed signs and traffic control devices.
- G. Existing and proposed storm drainage systems.
- H. Existing and proposed sewers and water mains (use ghost lines). Identify crossings and minimum distances between utilities.

- I. Horizontal curves.
- J. Horizontal stationing.
- K. Location of curbs, sidewalks, wheelchair ramps, and driveways (by station).
- L. Locations of monuments at all centerline intersections, cul-de-sacs, PCs, and PTs by station.
- M. Street luminaires, conduit for streetlights, traffic signals, and traffic signal loop detectors located within the vicinity of the project.
- N. Mailbox types and locations. Submit to postmaster for approval.
- O. Address any horizontal utility conflicts in plan.
- P. Street landscaping, if required.
- Q. Construction limits.
- R. Slope excavation and/or embankment limits.

3.04.9.2 Profile

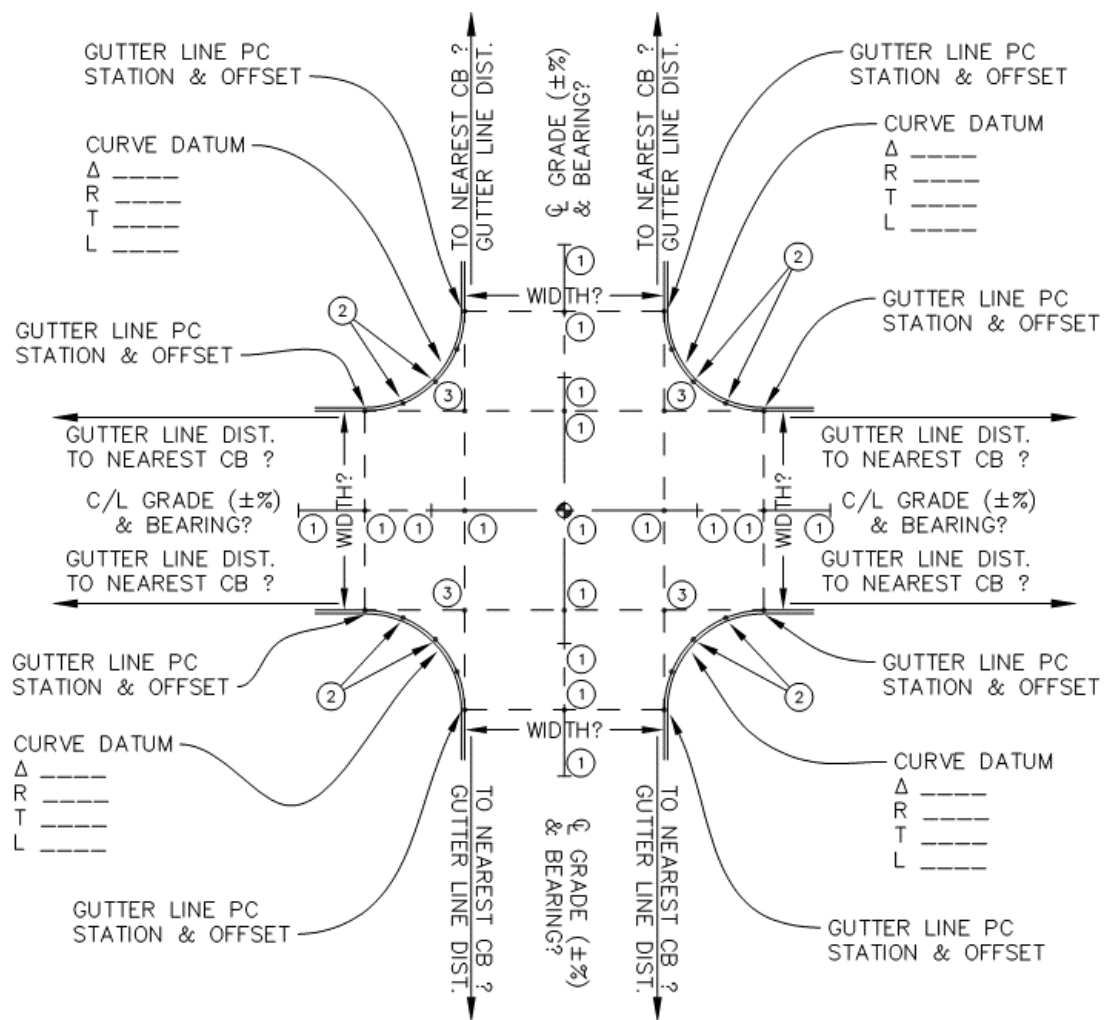
The profile should include the following items where applicable:

- A. Profiles shall be drawn using 1" = 20' horizontal and 1" = 2' vertical scales.
- B. Existing and proposed centerline road grade.
- C. Existing and proposed storm drainage systems.
- D. Existing and proposed sewers and water mains (use ghost lines). Identify crossings and minimum distances between utilities.
- C. Finish grade elevations every fifty feet (50') and every twenty-five feet (25') for vertical curves along design centerlines.
- D. Vertical curve information in profile section.
- E. Address vertical utility conflicts in profile.

3.04.9.3 Intersections

Intersection plans shall be twenty (20) scale drawings in conformance with the following figure:

Figure 3-1 Intersection Plan Sheet Requirements



NOTES:

- A. LABEL INTERSECTION & STATIONING. SHOW FINISH ELEVATIONS AT:
- ① CENTER LINES, AS SHOWN.
 - ② GUTTER LINE RADII: PC'S, PT'S, $\frac{1}{4}$ POINTS, & HIGH/LOW POINTS.
 - ③ GUTTER LINE PI'S.
- B. IF RADIUS POINT FOR R.O.W. & GUTTER LINE DIFFER, PROVIDE DATA OF R.O.W. CURVE.
- C. LABEL CENTERLINE INTERSECTION EQUATION STATIONS (IF APPLICABLE).

3.04.9.4 Typical Roadway Sections

Typical roadway sections shall show pavement depths, widths and materials, cross-slopes of pavement (%), centerline, dimensioned right-of-way lines, curb and gutter, ditches, embankment and excavation slopes (1:1), walls, etc. Typical sections will be labeled within identified station ranges.

3.04.9.5 Striping and Signing

Provide forty (40) scale plans per these Standards and MUTCD, including lane markers, pavement markings, and signing.

3.04.9.6 Signalization

Provide twenty (20) scale separate detailed signalization plan per City of Auburn Standards, including poles, bases, conduits, and traffic loops.

A. Signal Plan Sheet

1. The plan sheet shall conform to the following requirements:
 - a. For areas that require greater detail (such as the corner that has the controller), a blown-up detail may be necessary at a 1"=10' scale.
 - b. All proposed signal equipment, including signal poles, mast arms, heads, signs, junction boxes, conduit, loops, controller, and service cabinet shall be shown as bold.
 - c. All existing and proposed right-of-way information shall be shown and labeled on the plan, including easements needed for signal equipment. The line type shall be different for easements and right-of-way.
 - d. All proposed curb, sidewalk, proposed striping, and existing curb/striping (to remain) information shall be shown on the plan in gray scale (screened back).
 - e. Sight triangle lines shall be shown on plans in gray scale.
 - f. All proposed and existing underground and overhead utilities shall be shown and labeled on the plan in gray scale.
 - g. Provide on the plan signal construction notes as shown in Appendix B of this chapter.
2. Construction notes shall contain, but not be limited to:
 - a. Signal pole and foundation installation (including pole type, mast arm length, and installation of items on the pole).
 - b. Controller cabinet and foundation installation.
 - d. Coordination of utility removal/relocation.
 - e. Coordination of connection of power, and power source type.
 - f. Interconnect connection to other signals.
 - g. Removal of existing signal and/or street light equipment.
3. Displays: The plan sheet shall include the following displays:
 - a. Phase diagram display.

- b. Signal display showing signal layout of all vehicle signal heads and pedestrian heads.
- 4. Detection: The plan sheet shall include:
 - a. Stop bar, intermediate and advanced loop location and numbering.
 - b. Pedestrian push button location.
 - c. Preemption detection location and numbering.
- 5. Signal Poles and Associated Equipment: The plan sheet shall contain, but not be limited to:
 - a. Signal Pole Locations and Numbering: The locations shall be called out by the major arterial station and offset.
 - b. Signal head location and numbering.
 - c. Pedestrian head location and numbering.
- 6. Controller and Service Location:

At least one corner of the controller/service foundation shall be called out by the major arterial station and offset. The footprint of the foundation shall be shown on the plans with the controller and service cabinets oriented on the foundation as they would be placed in the field. If the information required to show all the controller/service conduit connections and foundation footprint makes the plan too cluttered, a blown-up detail of the corner containing this information is needed at a 1"=10' scale.
- 7. Power Source Location:

The location of the power source shall be identified on the plans.
- 8. Wire Schedule:
 - a. A wire schedule table shall include run numbers, conduit size, wire type, and comments.
 - b. Comments shall include, but not be limited to, number of twisted loop pairs for runs between the detection loops and adjacent junction box, identification of spare conduits, conduits utilized only by interconnect or illumination, and power cables.
 - c. For designs that include modifications to an existing signal, all existing wire runs affected by the design shall be shown on the wire schedule.
- 9. Junction box type and approximate location.
- 10. Signing:
 - a. Signs shall be shown on all mast arms. Signs that are post mounted but are signal related (such as a "signal ahead" sign) shall be shown on the signal plan.
 - b. A sign display shall be shown on the plan with the MUTCD sign designation, dimensions, and lettering type for all signs.
 - c. Indicate removal of existing stop signs after signal is in operation.
 - d. Installation of "New Signal Ahead" or "Signal Revision Ahead" signs.
- 11. Other Illumination:
 - a. Proposed illumination that will use the signal service cabinet, but is located outside the four quadrants of the intersection, shall be shown as proposed on a

separate illumination plan sheet. On the signal plan sheet, the illumination shall be shown as gray scale and labeled as "proposed illumination, see illumination plans." However, once the illumination enters the quadrants of the intersection (i.e., when it is using the same junction box as the signal equipment), it shall be shown as proposed on the signal plan and gray scale on the illumination plan.

b. Indicate the circuit that street lights are on.

B. Wire Diagram Plan

In general, the wire diagram shall include the following:

1. All signal heads, pedestrian heads, pedestrian push buttons, luminaires, preemption detectors, loops, and junction boxes drawn in schematic forms.
2. All termination points in the controller cabinet. The wire diagram should include every termination point the controller will have, including those that may not be used for this particular signal design.
3. All wiring associated with the items above, as well as the wiring for interconnect. The wire diagram should show how these items are connected to the controller.
4. Location of wire splices.
5. All termination numbering at each end of each wire. For example, the 5-conductor cable connecting a signal head to the controller should have the termination numbering called out at the signal head and in the termination points in the controller.
6. All wire colors at each end of the wire.
7. A call out to each wire run noting the number and type of each wire.
8. Intersection schematic with a north arrow showing approach phase.
9. Pole, signal head, pedestrian head, preemption detection, and loops shall be numbered on the wire diagram.

C. Pole Schedule Plan

The pole schedule shall include the following:

1. The pole schedule shall include a signal standard detail chart.
3. The pole schedule shall include pole orientation attachment and base detail, pole foundation detail, and signal standard detail.

3.04.9.7 Illumination

Street Light Plans shall be labeled as Street Light Plans, and shall be prepared, stamped, signed and dated by a professional engineer licensed by the State of Washington.

Street Light Plans will include references to all applicable City of Auburn Standard Details and/or Washington State Department of Transportation (WSDOT) Standard Plans, or copies of other specific details applicable to the project shall be shown on the plans.

Street Light Plans shall be provided on separate and uncluttered sheets that do not show unrelated street, utilities, or on-site improvements. Street Light Plans shall be drawn to an engineer's scale of 1" = 40'.

Street Light Plans shall at a minimum include the following applicable items for new or existing street lighting system:

A. Lighting schedule with the following information in a table format:

1. Luminaire make and model
2. Lamp/Ballast type
3. Lamp wattage
4. Uniformity Ratio
5. Veiling Luminance Ratio
6. Average Maintained Light Level
7. Light standard type
8. Mounting height (ft.)
9. Bracket or davit arm length (ft.)
10. Light distribution pattern
11. Luminaire spacing distance (ft.)
12. Light standard locations by station and offset from the centerline of the street to the center of the light standard. Show all existing street lights for a distance of 500 feet in both directions from the limits of the project site, including both sides of the street(s) and in medians.

B. Wiring/Conduit schedule with the following information in a table format:

1. Circuit number
2. Conduit size, material, and purpose (street lighting, traffic signal interconnect, spares, etc.).

C. Location of points of service (the PSE connection or service location and the new or existing City Electrical Service Cabinet(s)).

D. Location of junction boxes. Indicate junction box type and purpose (lighting, traffic signal, etc.).

F. Existing topography, including but not limited to the location of driveways, street trees (including species), street intersections, overhead utilities (including maximum and minimum heights), underground utilities (including sizes), medians, curb, and lane widths (pavement markings).

3.04.9.8 Streetscape

Provide information on planting of the public landscape strips along the street frontage. Information should include the following:

A. Type and size of trees.

- B. Tree spacing.
- C. Type of ground cover.
- D. Root control/barrier.
- E. Irrigation if applicable.
- F. Show all proposed and existing surface features and underground utilities.

3.04.9.9 Other Features

Include locations of any other feature including mailboxes and bus stops. Any mailbox placement that requires approval from the postmaster shall include the Postmaster approval block B-6 as shown in Appendix A of this chapter.

3.04.10 Site Landscape Plan Sheet

The site landscape sheets, when required, shall have the following applicable items:

- A. Adjacent streets both public and private.
- B. Have boundaries and dimensions of site.
- C. The location of on-site buildings.
- D. The location of on-site parking areas.
- E. The location and size of landscape areas.
- F. The location, species, and size of planting materials.
- G. The location of outdoor storage areas.
- H. The location of significant trees.
- I. Show all proposed and existing surface features and underground utilities.
- J. Landscape area calculations.
- K. The Planning approval block B-2 as shown in Appendix A of this chapter.

3.04.11 Site Irrigation Plan sheet

The site irrigation sheets, when required, shall have the following applicable items:

- A. The connection point to the City system.
- B. The size, location, and type of the backflow prevention.
- C. The proposed layout of the irrigation system.
- D. Be consistent with the site's building and landscaping plans.
- E. Show the existing and/or proposed location of all parcel lines.

3.04.12 Critical Area Restoration/Mitigation

A critical area restoration or mitigation sheet, when required, shall include the items as required by the City pursuant to chapter 16.10 of the Auburn City Code, and have the Critical Area approval block B-3 as shown in Appendix A of this chapter.

3.04.13 City Parks and Open Spaces

Any plan sheet that includes a park or open space that is to be dedicated to the City shall include the Auburn Parks approval block B-5 as shown in Appendix A of this chapter.

Appendix A – Approval Blocks

Sample Engineering Approval Block (B-1):

PROJECT REF: _____
THESE PLANS ARE APPROVED FOR CONFORMANCE WITH THE CITY OF AUBURN'S ENGINEERING REQUIREMENTS.
DEV. REVIEW ENGINEER: _____
APPROVED BY: _____
DATE APPROVED: _____

Sample Planning Approval Block (B-2):

PROJECT REF: _____
THESE PLANS ARE APPROVED FOR CONFORMANCE WITH THE CITY OF AUBURN'S PLANNING DEPARTMENT REQUIREMENTS.
APPROVED BY: _____
DATE APPROVED: _____

Sample Critical Area Approval Block (B-3):

PROJECT REF: _____
THESE PLANS ARE APPROVED FOR CONFORMANCE WITH THE CITY OF AUBURN'S CRITICAL AREA REQUIREMENTS.
APPROVED BY: _____
DATE APPROVED: _____

Appendix A (continued)

Sample Record Drawing Certification Block (B-4):

RECORD DRAWING CERTIFICATION	
THESE DRAWINGS CONFORM TO THE CONTRACTOR'S CONSTRUCTION RECORDS.	
BY _____	DATE _____
TITLE/POSITION _____	
CONFIRMED BY CITY _____	DATE _____

Sample Parks Department Approval Block (B-5):

PROJECT REF: _____
THIS PLAN SHEET REFLECTS THE CITY OF AUBURN PARKS DEPARTMENT MINIMUM REQUIREMENTS
APPROVED BY: _____ PARKS DIRECTOR
DATE APPROVED: _____

Sample Postmaster Approval Block (B-6):

CITY OF AUBURN POSTMASTER APPROVAL
APPROVED BY: _____
TITLE/POSITION: _____
DATE APPROVED: _____

Appendix B – Standard Notes

GENERAL NOTES

1. THIS DEVELOPMENT PROJECT SHALL CONFORM TO THE CITY OF AUBURN'S REQUIREMENTS AND BE IN ACCORDANCE WITH THE APPROVED PLANS. ANY CHANGES FROM THE APPROVED PLAN WILL REQUIRE APPROVAL FROM THE OWNER, ENGINEER, AND THE CITY.
2. ALL WORKMANSHIP AND MATERIALS SHALL CONFORM TO THE "WASHINGTON STATE DEPARTMENT OF TRANSPORTATION (WSDOT) STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION (CURRENT EDITION)," EXCEPT WHERE SUPPLEMENTED OR MODIFIED BY THE CITY'S CONSTRUCTION STANDARDS MANUAL. COPIES OF THE ABOVE DOCUMENTS SHALL BE AVAILABLE AT THE JOB SITE DURING CONSTRUCTION.
3. A PRE-CONSTRUCTION MEETING SHALL BE REQUIRED PRIOR TO THE START OF ALL CONSTRUCTION. CONTACT THE COMMUNITY DEVELOPMENT & PUBLIC WORKS DEPARTMENT AT 253-931-3010, TO SCHEDULE A MEETING.
4. LOCATIONS SHOWN FOR EXISTING UTILITIES ARE APPROXIMATE. THE CONTRACTOR IS CAUTIONED THAT OVERHEAD UTILITY LINES MAY NOT BE SHOWN ON THE DRAWINGS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE TRUE ELEVATIONS AND LOCATIONS OF ALL UNDERGROUND UTILITIES AND THE EXTENT OF ANY HAZARD CREATED BY OVERHEAD UTILITY LINES. IDENTIFICATION, LOCATION, MARKING, AND RESPONSIBILITY FOR UNDERGROUND FACILITIES OR UTILITIES, IS GOVERNED BY THE PROVISIONS OF CHAPTER 19.122 REVISED CODE OF WASHINGTON (RCW). PRIOR TO STARTING CONSTRUCTION, THE CONTRACTOR SHALL CALL ONE-CALL (811) FOR UTILITY LOCATIONS (WATER, SANITARY SEWER, STORM SEWER, GAS, POWER, TELEPHONE, AND CABLE).
5. IF A PROPOSED ROUTE IS NOT INCLUDED ON THESE PLANS, A PROPOSED ROUTE AND SCHEDULE FOR HAULING MATERIAL TO THE SITE SHALL BE SUBMITTED TO THE CITY FOR APPROVAL PRIOR TO THE START OF CONSTRUCTION. IF THE CITY BELIEVES THAT THE PROPOSED HAUL ROUTE WILL ADVERSELY IMPACT THE STREET NETWORK, A SEPA AMENDMENT MAY BE REQUIRED TO EVALUATE THE IMPACTS AND DETERMINE MITIGATION REQUIREMENTS BEFORE BEGINNING WORK. HAULING MAY BE LIMITED TO APPROPRIATE OFF-PEAK HOURS OR ALTERNATIVE ROUTES, AS DETERMINED BY THE CITY.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PUBLIC SAFETY ON AND AROUND THE PROJECT. PRIOR TO THE START OF WORK, ALL METHODS AND EQUIPMENT USED FOR TRAFFIC CONTROL AND STREET MAINTENANCE SHALL BE SUBMITTED TO THE CITY FOR APPROVAL. CONTRACTORS AND THEIR SURETY SHALL BE LIABLE FOR INJURIES AND DAMAGES TO PERSONS AND PROPERTY SUFFERED BECAUSE OF CONTRACTORS OPERATIONS OR NEGLIGENCE CONNECTED WITH THEM.
7. ALL CONSTRUCTION SURVEYING FOR EXTENSIONS OF PUBLIC FACILITIES SHALL BE DONE UNDER THE DIRECTION OF A WASHINGTON LICENSED LAND SURVEYOR OR A WASHINGTON LICENSED PROFESSIONAL CIVIL ENGINEER.
8. CERTIFIED DRAWINGS ARE REQUIRED PRIOR TO PROJECT ACCEPTANCE. REFER TO THE CITY'S "RECORD CONSTRUCTION DOCUMENT" HANDOUT.

Appendix B (continued)

GRADING AND EROSION CONTROL NOTES

1. WITHIN THE CITY OF AUBURN, ALL REQUIRED SEDIMENTATION AND EROSION CONTROL FACILITIES INDICATED ON THE PLANS MUST BE CONSTRUCTED AND IN OPERATION PRIOR TO LAND CLEARING AND/OR OTHER CONSTRUCTION ACTIVITIES. THESE FACILITIES SHALL BE MAINTAINED AND UPGRADED, IF NECESSARY, TO INSURE THAT SEDIMENT-LADEN WATER AND STORM DRAINAGE RUNOFF DOES NOT IMPACT THE ADJACENT PROPERTIES, NATURAL DRAINAGE WAYS, OR THE EXISTING CITY STORM DRAINAGE SYSTEM.
2. THE SOURCES FOR ALL MATERIAL IMPORTED TO THE SITE SHALL BE APPROVED BY THE CITY.
3. THE STORM DRAINAGE DETENTION (RETENTION IF INFILTRATION SYSTEM IS USED), SEDIMENTATION AND EROSION CONTROL FACILITIES DEPICTED ON THE APPROVED DRAWINGS ARE INTENDED TO BE MINIMUM REQUIREMENTS TO MEET ANTICIPATED SITE CONDITIONS. ADDITIONAL DRAINAGE AND EROSION CONTROL FACILITIES MAY BE REQUIRED AS SITUATIONS WARRANT DURING CONSTRUCTION. THE IMPLEMENTATION, MAINTENANCE, REPLACEMENT AND ADDITIONS TO THESE CONTROL SYSTEMS SHALL BE THE RESPONSIBILITY OF THE PERMITEE.
4. THE TEMPORARY EROSION CONTROL FACILITIES, INCLUDING ALL PERIMETER CONTROLS AND THE DETENTION (RETENTION IF INFILTRATION SYSTEM IS USED), CONTROL PONDS, SHALL REMAIN IN PLACE UNTIL FINAL SITE CONSTRUCTION IS COMPLETED. AFTER CITY APPROVAL, THE CONTRACTOR WILL BE RESPONSIBLE FOR REMOVING ALL TEMPORARY FACILITIES.
5. THE CONTRACTOR WILL BE REQUIRED TO WATER THE SITE, AS NECESSARY, TO REDUCE DUST EMISSIONS AS A RESULT OF CONSTRUCTION ACTIVITY.
6. NO TRACKING IN THE ROADWAY IS ALLOWED. IF SEDIMENT IS TRACKED ONTO THE ROAD, THE ROAD SHALL BE THOROUGHLY AND IMMEDIATELY CLEANED BY SHOVELING OR PICKUP SWEEPING. TRANSPORT SEDIMENT TO A CONTROLLED SEDIMENT DISPOSAL AREA. KEEP STREETS CLEAN AT ALL TIMES.
7. ALL AREAS OF ACTIVE EARTHWORK WHICH HAVE THE POTENTIAL FOR EROSION AND SEDIMENTATION IMPACTS ON ADJACENT PROPERTIES, NATURAL DRAINAGE WAYS, OR THE EXISTING CITY STORM DRAINAGE SYSTEM MUST BE STABILIZED ACCORDING TO THE FOLLOWING SCHEDULE: FROM MAY 1 TO SEPTEMBER 30, AREAS AT FINAL GRADE AND THOSE THAT ARE SCHEDULE TO REMAIN UN-WORKED FOR MORE THAN SEVEN (7) DAYS SHALL BE STABILIZED. FROM OCTOBER 1 TO APRIL 30 EARTHWORK ACTIVITIES SHALL BE CONDUCTED IN STAGES IN ORDER TO MINIMIZE SOIL EXPOSURE. EXPOSED SOILS THAT WILL REMAIN UN-WORKED FOR MORE THAN TWO (2) DAYS SHALL BE STABILIZED IMMEDIATELY.

Appendix B (continued)

FIRE SPRINKLER SYSTEMS NOTES

SPRINKLER SYSTEMS SHALL MEET CITY OF AUBURN STANDARD 7.01.6.2 AND THE FOLLOWING REQUIREMENTS:

1. PROPOSED FIRE LINE TO BE SIZED BY A FIRE PROTECTION ENGINEER.
2. BACKFLOW PROTECTION IS REQUIRED ON FIRE SPRINKLER LINES
3. A SEPARATE DETAILED PLAN OF THE UNDERGROUND FIRE SPRINKLER SUPPLY LINE SHALL BE APPROVED BY THE FIRE MARSHAL AND INSTALLED BY A WASHINGTON STATE CERTIFIED LEVEL "U" CONTRACTOR IN ACCORDANCE WITH WAC 212-80-010.
4. A POST INDICATOR VALVE SHALL BE INSTALLED ON THE FIRE SPRINKLER SUPPLY LINE TO ISOLATE THE SYSTEM FROM THE CITY'S WATER SYSTEM WHEN REQUIRED FOR REPAIR.
5. BLOCKING, PIPING, AND RODDING DETAILS SHALL BE PROVIDED WITHIN THE SUBMITTAL.
6. APPROVAL OF THE CIVIL PLANS DOES NOT APPROVE THE INSTALLATION OF THE SPRINKLER SYSTEM SUPPLY PIPING.

CROSS CONNECTION CONTROL NOTES

CROSS CONNECTION CONTROL SHALL MEET THE FOLLOWING REQUIREMENTS:

1. ALL BACKFLOW PREVENTION ASSEMBLIES SHALL BE INSTALLED IN A MANNER THAT WILL ALLOW PROPER OPERATION, AND IN-LINE TESTING AND MAINTENANCE.
2. A BACKFLOW ASSEMBLY PERMIT IS REQUIRED FOR ALL ASSEMBLIES INSTALLED WITHIN THE CITY OF AUBURN, AND/OR THE CITY'S WATER DISTRIBUTION SYSTEM.
3. BACKFLOW ASSEMBLIES MUST BE ON THE CURRENT WASHINGTON STATE DEPARTMENT OF HEALTH – BACKFLOW ASSEMBLIES APPROVED FOR INSTALLATION LIST.
4. BACKFLOW ASSEMBLIES MUST BE TESTED BY A STATE CERTIFIED BACKFLOW ASSEMBLY TESTER, AND INSPECTED AND APPROVED BY A CITY OF AUBURN CROSS CONNECTION CONTROL SPECIALIST.

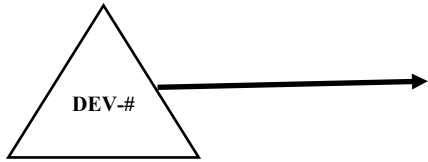
Appendix B (continued)

SIGNAL CONSTRUCTION NOTES

1. THE LOCATION OF ALL CONDUIT, JUNCTION BOXES, AND CABINETS SHOWN ON THIS PLAN ARE FOR GRAPHIC PRESENTATION ONLY AND FINAL LOCATION SHALL BE DETERMINED BY THE ENGINEER.
2. ALL TRAFFIC SIGNAL AND PEDESTRIAN HEADS AND PUSH BUTTONS SHALL BE SECURELY AND COMPLETELY COVERED WHILE SIGNAL IS NOT IN OPERATION.
3. ALL CONDUCTORS FOR SIGNAL HEADS, LOOPS, PEDESTRIAN HEADS, PUSH BUTTONS AND STREETLIGHTS SHALL BE LABELED IN EACH JUNCTION BOX.

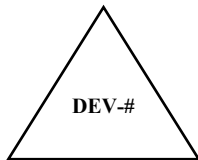
Appendix C – Deviations

Plan Sheet Deviation Call-Out:



- Leader arrow points to deviation location.
- DEV-# is the City assigned deviation number

Plan Sheet Deviation Description:



SECTION X.X.X OF THE _____, APPROVED _____.

- Description is included with the construction notes on the plan sheet where the deviation is located.
- Description references the Chapter, Section, and Subsection Number (where applicable) of the Engineering Design or Construction Standards where the standard that is being deviated from is
- Includes approval date in mm/dd/yyyy format.

Chapter 4 Report Preparation Requirements

4.00 Preface

This chapter describes how technical engineering reports should be laid out to meet City requirements and provide a format that is easy to follow and understand. Reports need to meet these basic standards in order to move through the review process in an efficient manner.

4.01 General Requirements

The following general requirements shall be met for all technical engineering reports being submitted for review and approval:

- A. All reports and calculations shall be prepared, stamped, signed, and dated by a Washington State licensed professional civil engineer.
- B. All reports and calculations shall be neat, uncluttered, legible, and in conformance with the requirements herein.
- C. All engineering reports shall be bound with the civil engineer's stamp clearly visible.
- D. Reports shall reference City Standards as necessary.
- E. All reports shall be provided in both hardcopy and electronic format (PDF).

4.02 Report Types

The following are basic types of reports submitted as supporting project information. Depending on the complexity or simplicity of the project and its location, the amount of detail, and the number and types of reports required will be subject to change. The examples given are the typical reports required for a standard project, there may be other reports required that are specific to a particular project.

- | | |
|----------------------------|-------------------------|
| A. Geotechnical Reports | See Section 4.03.1 |
| B. Stormwater Site Plans | See SWMM Volume 1 Ch. 4 |
| C. Critical Area Report | See Section 4.03.3 |
| D. Traffic Impact Analysis | See Section 4.03.4 |

4.03 Report Requirements

4.03.1 Geotechnical Reports

Geotechnical reports are required to support the design and construction of various facilities as specified in the Auburn City Code, these design standards, the SWMM, the Engineering Construction Standards, and other documents. The geotechnical report format shall include (at a minimum) the following applicable items:

- A. Title page including project name and address.
- B. General information, which includes existing site conditions.
- C. Site history including any prior grading.

- D. Subsurface soil information and conditions including seasonal high groundwater elevations. Seasonal groundwater levels shall be determined using groundwater monitoring well(s) and shall be required where consideration of groundwater levels is a design consideration.
- E. Soil log information and locations of explorations.
- F. Soil characteristics including suitability for fill and compaction requirements.
- G. Slope stability analysis.
- H. Seismic hazards.
- I. Site plan showing the topography and proposed structures and paving.
- J. Grading information including depth of cuts and recommended slopes.
- K. Recommendations on temporary erosion and sediment control.
- L. Conclusions and recommendations for foundations.
- M. Appendix with test pit and boring logs.
- N. Information on infiltration rates for use in designing low impact design facilities, retention ponds and infiltration trenches.
- O. California Bearing Ratio (CBR) information for pavement design.
- P. Additional requirements for geotechnical reports are included in Volume 1 of the SWMM.

4.03.2 Stormwater Site Plan Report

The Stormwater Site Plan Report shall contain the information as noted in Appendix J of Volume I of the SWMM

4.03.3 Critical Area Report

- A. Title Page including project name, contact information, description of the proposal, and identification of all local, state, and other wetland related permits required for the permit.
- B. State accuracy of the report.
- C. Documentation of field work.
- D. Description of methodologies used in study.
- E. Identify and characterize of all critical areas, wetlands, water bodies, buffers, etc. on or adjacent (within 300 feet of the project boundaries) to the proposed project area.
- F. Provide wetland rating, required buffers based on a professional survey.
- G. A description of proposed actions including estimate acreages of impacts to wetland and buffers.
- H. An assessment of probable cumulative impacts to the wetlands and buffers.
- I. Mitigation measures proposed.
- J. Scaled site plan.

4.03.4 Traffic Impact Analysis

- A. Title Page including project name and address.
- B. Executive Summary.
- C. Table of Contents.
- D. Introduction consisting of a description of the project, location, site plans with access to city streets, circulation network, land use and zoning, phasing plan, project developer and contact person, reference other studies.
- E. Traffic Analysis to include assumptions, existing and projected traffic volumes, project trip generations, trip distribution, level of service (LOS), and warrant analysis.
- F. Appendix with all calculations.
- G. Information as specified in Section 10.16 of these design standards.

4.03.5 Construction Stormwater Pollution Prevention Plan (SWPPP)

See Section 5.01.3 of these design standards and Chapter 2 of Volume 2 of the SWMM.

4.03.6 Other Reports

Other reports may be required on a site-specific basis. The specific information required in these reports shall be determined during the SEPA process or by the department requiring the report. These reports shall include the following basic items:

- A. Title page including project name and address.
- B. General information, which includes existing site conditions.
- C. Site plan showing the topography and proposed structures and paving.
- D. Conclusions and recommendations.
- E. Appendix with collected field information.

Chapter 5 TESC, Clearing and Grading

5.00 Preface

The design of temporary erosion and sediment control (TESC) clearing and grading plans shall conform to the requirements herein.

Compliance with these standards does not alleviate the design engineer from using sound professional engineering practices. The design criteria contained herein are the minimum acceptable under standard conditions. Special conditions may require more stringent requirements that will be addressed during the plan review process.

The purpose of these requirements is to provide the design criteria necessary to preserve the City of Auburn's water courses; minimize surface and ground water quality degradation; control sedimentation in creeks, streams, rivers, ponds, lakes, and other water bodies; protect adjacent and downstream property owners from increased runoff rates which could cause erosion and flooding; and ensure the safety and stability of City of Auburn's roads and rights-of-way.

5.01 TESC Design Criteria

5.01.1 Temporary Erosion and Sediment Control (TESC)

TESC design requirements shall meet design criteria requirements as identified in Volume II of the City of Auburn Surface Water Management Manual (SWMM), and follow City of Auburn grading requirements.

All TESC measures regardless of design and implementation must meet the latest Nephelometric Turbidity Units (NTU) test requirements. The City will conduct tests and if the applicable limits are not met, the project will be halted until such time as it is brought into compliance.

5.01.2 Temporary Detention Systems

The detention shall be defined as the active storage available a minimum of one foot (1') above the seasonal high ground water.

5.01.3 Construction SWPPP

Any project with exposed soil meeting the requirements of the Chapter 2 of Volume 2 of the SWMM shall prepare a Stormwater Pollution Prevention Plan (SWPPP). The plan shall follow the SWPPP Template or Short Form (where approved by the City) from the SWMM, and contain the following information:

- A. Purpose is to be clearly stated.
- B. Property location.
- C. Property description.
- D. Contacts – including name, title, organization, and phone number of person or persons responsible for maintaining the project site.
- E. Temporary Erosion and Sediment Control (TESC) plan for the wet season.

- F. Inspection and monitoring schedule including the contact information for the third party monitor to be used to complete all required inspections and reports.
- G. Maintenance and repair responsibility clearly identified.
- H. Identification of stockpile(s) of TESC materials and their location(s).
- I. An Exhibit A – legal description.
- J. An Exhibit B – vicinity map.
- K. Inspection Report Form.
- L. BMPs (Best Management Practices) to be employed (site specific).

5.02 Land Clearing

5.02.1 Purpose

The following section establishes the requirements for land clearing. These requirements do not supersede nor are they intended to be inconsistent with any landscaping requirement established by the Zoning Ordinance or other City action. A land clearing permit shall be required except for the following situations:

- A. Situations where the land clearing is included in the grading or building permit.
- B. The removal of dead or diseased trees, shrubs, or ground cover.
- C. Clearing associated with continuous agricultural uses, excluding timber cutting not otherwise exempted.
- D. Clearing not to exceed 6,999 square feet within individual lots, for the purpose of the construction of a single-family home or duplex, provided a building permit has been issued by the city prior to commencing the clearing activities and construction of the structure starts within ninety days of commencing the clearing activities. A permit will be required if said clearing is proposed in any critical area or within its buffer.
- E. The removal of up to six trees per lot within any 12-month period, or for lots greater than one acre, up to six trees per acre within any 12-month period, with fractional acres of one-half acre or more considered to be a whole acre.
- F. The removal of trees and ground cover in emergency situations involving immediate danger to life or property.
- G. Routine landscape maintenance and minor repair.
- H. Removal of trees and vegetation consistent with an approved surface mining permit.
- I. Removal of a tree from property zoned residential that endangers a permanent structure by being closer to the structure than the distance from the base of the tree to its top, regardless of whether the tree is located on the same property as the structure.

Land Clearing permits will typically be required in situations where a significant amount of trees and vegetation are proposed for removal in a manner that will not trigger the grading permit requirements. (See Section 2.02)

5.02.2 Plan/Permit Requirements

The following information shall be provided prior to the approval of a land clearing permit:

- A. A statement as to the purpose for clearing and the subsequent use of the property.

- B. The method of work including details justifying how the work will be performed without triggering the requirements for a grading permit.
- C. A cover sheet and site plan (See Chapter 3) showing the vegetation to be removed and the location and type of all existing significant trees.
- D. If the clearing is to include the removal of ground cover, a TESC plan may be required.
- E. A plan showing existing trees six inches (6") in diameter and larger for evergreens and four inches (4") in diameter or larger for deciduous. The plan shall indicate if a tree is to either be retained or removed.
- F. The area to be cleared or disturbed in square feet.

5.02.3 General Requirements

- A. Clearing shall not unreasonably create or contribute to erosion, landslides, flooding, siltation, or other pollution as determined by the City.
- B. Clearing shall contain reasonable provisions for the preservation of natural features, vegetation, sensitive areas, and drainage courses.
- C. Clearing shall be conducted so as to expose the smallest area of soil for the least amount of time.
- D. A licensed and bonded contractor shall perform the clearing of any tree that is within striking distance of a structure, overhead power/utility lines, public right-of-way, roads or that has the potential to cause damage to other trees.
- E. A right-of-way use permit shall be required when the public right-of-way is used to clear, stockpile, or load products and/or debris resulting from clearing.

5.03 Grading

5.03.1 Purpose

The following section establishes the requirements for grading. These requirements do not supersede nor are they intended to be inconsistent with any landscaping requirement established by the Zoning Ordinance or other City action. A grading permit shall be required except for the situations described in ACC 15.74.050 or as listed below:

- A. Upon approval of the city engineer or his/her designee, the broadcasting of less than 500 cubic yards of topsoil, peat, sawdust, mulch, bark, chips, or solid nutrients used for landscaping or soil conditioning on a lot, tract or parcel of land during any 24-month period, provided the finished depth does not increase the grade from the existing grade by more than eight inches.

5.03.2 Excavations

- A. Cut slopes shall generally be constructed no steeper than two horizontal to one vertical (2:1). The City may approve steeper slopes after a geotechnical analysis is performed justifying a steeper slope.

Upon City approval, a steeper slope may also be used in the following cases:

- a. A slope of one-and-a-half horizontal to one vertical (1.5:1) may be used if no structure is to be supported, the slope is less than eight feet (8') in height, and the slope can be adequately protected against erosion.

- b. A slope of one horizontal to one vertical (1:1) may be used for cuts into stable bedrock.
- B. Cut slopes shall be stabilized by terracing, cat tracking, jute mat, grass sod, hydro-seeding, or by other planting or surfacing materials acceptable to the City.
- C. The City may also require geotechnical analysis for the following:
 - a. Slopes with sub-surface or surface water flows.
 - b. In areas of questionable soils conditions.
 - c. Where the length of the slope requires terracing.
 - d. In other situations where slope stability could be in question.

5.03.3 Fills

- A. Fill slopes shall generally be constructed no steeper than two horizontal to one vertical (2:1). The City may approve steeper slopes after a geotechnical analysis is performed justifying a steeper slope. Temporary fills for preloading of building pads may use a slope one and one half horizontal to one vertical (1.5:1).
- B. Fill slopes shall be stabilized by terracing, cat tracking, jute mat, grass sod, hydroseeding, or by other planting or surfacing materials acceptable to the City.
- C. The City may also require geotechnical analysis for the following:
 - a. Slopes with surface water flows.
 - b. In areas of questionable soils conditions.
 - c. Where the length of the slope requires terracing.
 - d. In other situations where slope stability could be in question.
- D. A minimum horizontal setback of five feet (5') shall be provided between the bottom of any fill placement and the top of the bank of any defined drainage channel.
- E. When filling a site, particular care should be taken to prevent impeding the existing upstream surface drainage flow.

5.03.3.1 Preparation for Fill

Prior to any fill being placed, all vegetation, topsoil and other unsuitable material shall be removed unless dictated otherwise by the geotechnical engineer. Where fill is being placed on existing slopes of greater than five horizontal to one vertical (5:1), a geotechnical analysis shall be performed.

5.03.3.2 Compaction

Fill material shall be placed in lifts of no more than twelve inches (12") and compacted to ninety percent (90%) or greater of the maximum dry density as determined by ASTM D1557 Modified Proctor or as directed by the geotechnical engineer.

5.03.3.3 Slope Easement

Slope easements adjacent to the right-of-way for maintenance of cut or fill slopes and drainage facilities may be required. Easement shall be from the catch point plus a minimum of five feet (5'), as determined by the City.

5.04 Retaining Walls

Retaining walls can vary with design and must be approved by the City. Retaining walls in locations where the possibility exists for pedestrians to walk near the top edge of the wall shall require protective fencing. Retaining walls with a vertical difference of 30-inches or greater along pedestrian corridors and areas where maintenance personnel will be required to access will require a handrail for safety of pedestrian traffic.

Retaining walls constructed as public facilities shall require dedication of easement(s) of sufficient terms and area to allow for maintenance, repair, removal, and reconstruction of the wall. The minimum easement width for this purpose shall be ten feet (10') measured from the face of the wall or a minimum of five feet (5') beyond any and all structural elements behind the wall (whichever is greater).

5.04.1 Rockeries

Rockeries may be used for containment of cut slopes or fill embankment up to a maximum height of eight feet (8'). Rockeries over four feet (4') in height, surcharged, or in areas of questionable soil stability will require an engineered design. The engineered design shall include a soils investigation and report by a geotechnical engineer and structural calculations to support the rockery design.

5.04.1.1 Size

Size Categories include:

Two-man rocks (200 - 600 pounds) 18" - 28" average diameter.

Three-man rocks (600 - 2000 pounds) 28" - 36" average diameter.

Four man rocks (2001 - 4000 pounds) 36" - 48" average diameter.

5.04.1.2 Material

The rock material shall be as rectangular as possible. No stone shall be used that does not extend through the wall. The quarried rock shall be hard, sound, durable, and free from weathered portions, seams, cracks, and other defects. The rock density shall be a minimum of 160 pounds per cubic foot, measured accordingly to WSDOT test method 107 (Bulk Specific Gravity - S.S.D. basis).

5.04.1.3 Underdrains

Underdrains are required for all retaining walls over four feet (4') in height (i.e., concrete walls, MSE walls, soil nail walls, block retaining walls, etc.).

A minimum six-inch (6") diameter perforated or slotted drainpipe shall be placed in a shallow excavated trench located along the inside edge of the keyway. The pipe shall be bedded on and surrounded by "Gravel Backfill for Drains" (WSDOT/APWA 9-03.12(4)) to a minimum height of eighteen inches (18") above the bottom of the pipe. A

filter fabric shall surround the gravel backfill and shall have a minimum of one foot (1') overlap along the top surface of the gravel. The perforated pipe shall be connected to a storm drain system or to an acceptable outfall.

5.04.2 Block Retaining Walls

Block retaining walls, (e.g., Keystone, Allan Block, Ecology Block) may be used for containment of cut slopes or fill embankment. Block retaining walls over four feet (4') in height, surcharged, or in areas of questionable soil stability will require an engineered design. The engineered design shall include a soils investigation and report by a geotechnical engineer and structural calculations to support the block wall design.

5.04.2.1 Material

Blocks used for retaining walls shall be in good condition and structurally sound; cracked and/or broken blocks should be returned to the manufacturer. Unless designed as a gravity wall (ecology blocks), block walls over four feet (4') in height shall employ geo-grid type material to increase the structural stability of the wall.

5.04.2.2 Underdrains

(See Section 5.04.1.3)

5.04.3 Reinforced Concrete Walls

Reinforced concrete walls or cast-in-place concrete walls may be used for containment of cut slopes or fill embankment. Concrete retaining walls over four feet (4') in height, surcharged, or in areas of questionable soil stability will require an engineered design. The engineered design shall include a soils investigation and report by a geotechnical engineer and structural calculations to support the concrete wall design.

5.04.3.1 Material

A minimum 3,000-psi structural reinforced concrete shall be used in the design of concrete retaining walls.

5.04.3.2 Underdrains

(See Section 5.01.4.3)

5.04.4 Mechanically Stabilized Earth Walls (MSE Walls)

MSE walls may be used in conjunction with other retaining walls or as a stand-alone application when constructing fill slopes. MSE walls will require an engineered design. The engineered design shall include a soils investigation and report by a geotechnical engineer and structural calculations to support the MSE wall design.

5.04.4.1 Material

MSE walls shall employ well-draining structural soil compacted to the geotechnical engineer's specifications.

5.04.4.2 Underdrains

(See Section 5.01.4.3)

5.05 Construction Sequence

5.05.1 Requirements

A construction sequence is intended to ensure that the timing and installation of storm drainage and erosion control measures are in place prior to activities that may cause erosion to occur. The following elements should be included in a construction sequence:

- A. Attendance at a pre-construction meeting with City of Auburn officials.
- B. Establishment of clearing and grading limits.
- C. Construction of temporary construction entrance.
- D. Construction of perimeter ditches, filter fabric fences, and other erosion control devices as shown.
- E. Construction of storm drainage control (applicant to be specific) facilities including emergency overflow as applicable.
- F. Construction of ditches and swales as necessary to direct all surface water to the storm drainage control (be specific) facilities as clearing and grading progress. Prevention of uncontrolled surface water being allowed to leave the site at any time during the grading operations.
- G. Establishment of at what point grading activities can begin, which is usually only after all perimeter drainage and erosion control measures are in place.
- H. For sites with a final development plan, the following shall also be addressed when applicable:
 - 1. Installation of on-site permanent storm drainage, sanitary sewer, and water facilities.
 - 2. Site paving.
 - 3. Indicate at what point building construction may begin.
 - 4. A description of how to transition from the temporary to permanent storm facilities.
 - 5. The possibilities of any phased construction.
 - 6. Any off-site public or private improvements including the general timing and duration.
 - 7. The removal of all TESC measures at project completion upon City approval.
- I. The TESC plan sheet shall also include a construction sequence element which clearly identifies the timing and methodology required to:
 - 1. Contain areas of active earthwork to prevent uncontrolled discharge of storm drainage
 - 2. Minimize erosion and the extent and time soils are exposed on-site.
 - 3. Address seasonal variations in weather conditions (the period of greatest concern is October 1 through April 30). A separate winterization plan as part of the SWPPP may be required.
 - 4. Prevent tracking of sediment onto City streets.
 - 5. Protect permanent on-site and off-site storm drainage systems.

Chapter 6 - Storm Drainage Facilities

6.00 Preface

The purpose of these requirements is to provide the design criteria necessary to preserve the City of Auburn's water courses; to minimize surface and ground water quality degradation; to control the sedimentation in creeks, streams, rivers, ponds, lakes, and other water bodies; to protect adjacent and downstream property owners from increased runoff rates which could cause erosion and flooding; to ensure the safety of City of Auburn's roads and rights-of-way; and to decrease drainage-related damage to both public and private property. The standards also are required to control runoff from development, redevelopment and construction sites to comply with the Western Washington Phase II Municipal Stormwater Permit issued by the State of Washington Department of Ecology.

Compliance with these standards does not alleviate the design engineer from using sound professional engineering practices. The design criteria contained herein are the minimum acceptable under standard conditions. Special conditions may require more stringent requirements that will be addressed during the plan review process.

The City's Comprehensive Drainage Plan establishes drainage basins and design parameters used to estimate future line hydraulic capacities. Anyone proposing to extend or modify the City's storm drainage system should contact the Community Development & Public Works Department for information on line sizes and locations. Developer constructed public storm drainage improvements shall be installed by means of a Facility Extension Agreement (FAC) between the developer and the City. The Community Development & Public Works Department can provide information on this agreement as well as applicable permit and connection fee estimates.

6.01 SWMM Requirements

All requests for developing a storm drainage system must comply with the City of Auburn Surface Water Management Manual (SWMM). The City of Auburn SWMM has replaced the standards formerly listed here.

6.02 Additional Requirements

The following additional requirements supersede and replace any conflicting requirements specified in the SWMM.

6.02.1 Storm Drainage Pipes and Structures

Storm drainage pipes and manholes shall meet the requirements specified in Chapter 8, Sanitary Sewer Facilities, with the following additions:

- A. Catch basins and inlets shall be constructed per the following:

Catch Basin Type I	WSDOT Standard Plan B-5.20	15-inch diameter max. pipe size, 5-foot max. depth to invert.
Catch Basin Type II	WSDOT Standard Plan B-10.20	See Standard Detail.
Concrete Inlet	WSDOT Standard Plan B-25.60	15-inch diameter max. pipe size, 5-foot max. depth to invert., only utilized for single pipe and where a full depth catch basin is not feasible.
Cement Concrete Curb and Gutter Pan	WSDOT Standard Plan F-10.16	Utilized along curb and gutter sections.
Rectangular Vaned Grate	WSDOT Standard Plan B-30.30	Utilized for all catch basins along curb and gutter sections unless in a sag condition.
Rectangular Frame (Reversible)	WSDOT Standard Plan B-30.10	Utilized for all catch basins.
Combination Inlet	WSDOT Standard Plan B-25.20	Utilized in sag conditions along curb and gutter.

Chapter 7 Water Facilities

7.00 Preface

The design and construction of Public Water Facilities shall conform to the State of Washington Department of Health (DOH) Design Standards for Group A Public Water Systems, Standard Specifications of the American Water Works Association (AWWA), and the most recent published and adopted edition of the Uniform Plumbing Code (UPC), unless modified herein.

Compliance with these standards does not alleviate the design engineer from using sound professional engineering practices. The design criteria contained herein are the minimum acceptable under standard conditions. Special conditions may require more stringent requirements that will be addressed during the plan review process. Contact the City of Auburn Engineering Services for specific requirements for the design of pump stations, wells, reservoirs, treatment systems, and other special facilities.

The design criteria used to estimate future line capacities are established in the City's Comprehensive Water Plan. Anyone proposing to extend or modify the City's water system should contact the Community Development & Public Works Department for information. Applicants needing to construct public water improvements shall enter into a Developer Public Facility Extension Agreement (FAC) with the City. The City's Permit Center can provide information on this agreement as well as applicable permit and connection fee estimates.

7.01 Design Criteria

7.01.1 Water Mains

The design of water mains shall meet the following requirements:

7.01.1.1 Water Main Sizing

Public water mains shall be sized using the following criteria:

- A. New water mains shall be sized as indicated in the City's Comprehensive Water Plan. For lines not specified in the plan, the mains shall be sized as described in this section.
- B. Water mains in single-family residential areas shall be a minimum of eight inches (8") in diameter.
- C. Water mains in multi-family residential and non-residential areas shall be a minimum of twelve inches (12") in diameter. Onsite water main loops, with no possibility of future extension as determined by the City Engineer, serving two or less fire hydrants may be reduced to a minimum diameter of eight inches (8").
- D. Water mains shall be sized under fire flow conditions, so that the flow velocity shall not exceed eight feet per second (8 fps) in distribution mains or five feet per second (5 fps) in transmission mains.
- E. Exceptions to the minimum diameter allowed may be made in small cul-de-sacs and in areas where looping of a main is not feasible. In these cases, the main may be a minimum of four inches (4") in diameter after the last fire hydrant connection.

If a conflict arises between two or more of these criteria, the water main shall be designed using the largest pipe diameter required.

7.01.1.2 Water Main Location

- A. Water mains shall be installed with no less than forty-two inches (42") and no more than seventy-two inches (72") finished cover. Water mains shall maintain minimum cover to the maximum extent feasible.
- B. Water mains shall be located in the public right-of-way or within a public water utility easement. Water mains located in the public right-of-way shall meet the requirements of Section 9.01.2 (Public and Private Utilities Located Underground with City Right-of-Way).
- C. Water mains shall be located a minimum horizontal distance of ten feet (10') from buildings and sanitary sewer mains and a minimum horizontal distance of five feet (5') from all other utilities. The minimum separation distance is measured from the outside wall of each pipe.
- D. At crossings between utilities, water mains shall be located a minimum vertical distance of eighteen inches (18") above sanitary sewer mains and a minimum vertical distance of twelve inches (12") from all other underground utilities, and shall be in conformance with the applicable sections of the State of Washington Department of Ecology's "Criteria for Sewage Works Design" manual (DOE Manual) unless modified herein.
- E. Water mains shall be extended through the full width of the property to be served. Whenever possible, provisions shall be made for looping all existing and new dead-end mains associated with the project. If at the time of project approval this is not feasible, an easement shall be provided and the main extended to the adjacent property line or right-of-way for future looping of the dead-end main.
- F. The placement of new water mains shall be done in a manner that allows such lines to be readily repaired and/or replaced without impacting other adjacent facilities or structures.

7.01.1.3 Water Main Fittings

- A. Blowoffs (**See Standard Detail W-03 or W-04**) are required on dead-end water mains with a diameter of six inches (6") or less; hydrants are required for dead-end mains over six inches (6") in diameter. Blowoffs shall also be installed at the low point of a depressed "sag" section of a water main, except where a fire hydrant is installed within fifty feet (50') of said area. Blowoffs shall be placed in a level clear area within the right-of-way or easement, be located as close to the main as possible, and be easily accessible to the City.
- B. Combination air release valves (**See Standard Detail W-02**) are required at high points in water mains when an abrupt vertical change in pipe elevation exceeds one pipe diameter, except where fire hydrants are installed within fifty feet (50') of said area. Combination air release valves shall be placed within a level clear area within the right-of-way or easement and be easily accessible to the City.
- C. All bends shall have mechanical or flanged joints and concrete thrust blocking (**See Standard Detail W-01**). The City may require restrained joints in lieu of thrust blocking in special conditions.

- D. Tees shall have mechanical or flanged joints and concrete thrust blocking (**See Standard Detail W-01**). When connecting to an existing public water main, a tapping tee and valve may be used if only a single valve is needed at the tee or unless otherwise approved or required by the City.
- E. Tapping tees are not allowed on commercial fire lines or other water taps needing uninterruptible service; a cut-in tee or installed tee is required.
- F. Size-on-size taps are not allowed unless authorized in writing by the city engineer or his/her designee.
- G. The maximum allowable deflection per joint for ductile iron water mains shall be four degrees (4°).

7.01.2 Water Services

See Standard Details W-06, W-13 through W-16a, and W-20.

The City owns and shall maintain the water service line to the meter, the meter and setter, the meter radio, the meter tailpiece, and the meter box. The property owner owns and shall maintain the tailpiece connection fitting, shut-off valve, service line, and other facilities such as pressure reducing valves, pumps, or backflow prevention assemblies behind the meter. For fire sprinkler connections, City ownership and maintenance responsibilities include and cease at the valve installed at the point of connection between the main and the fire service.

7.01.2.1 Domestic Services

Domestic Water Services are defined as any service that connects directly to plumbing within a structure and is used for drinking, cooking, washing, and other standard uses of potable water. Domestic water services shall meet the following requirements:

- A. Installation of corporation stops, water services, and meters shall be per City of Auburn Standard Details. The City may, at the City's option, install services from public water mains to the meter in existing right-of-ways and easements. The developer/contractor will install and/or replace all applicable services when installing new water mains required for the project. The City will furnish and install the meter for services of two inches (2") and smaller.
- B. Water meters of three inches (3") and larger will be purchased from the City and installed by the developer/contractor under City observation. Where vaults are required, the vault roof shall contain a 2" port for remote read device.
- C. Water meters shall be located in a level unobstructed area not subject to vehicular parking or travel, and as close to the City main as possible with the distance not to exceed fifty feet (50').
- D. Residential sites shall have water meters placed in landscape strips within the right-of-way, set two (2) inches above the finished grade including landscaping and mulch. If no unpaved areas exist in the right-of-way, water meters may be placed outside the right-of-way in unpaved areas within a public water utility easement.
- E. Commercial and industrial sites shall have meters located near driveway entrances within the right-of-way or within public water utility easements in landscape islands located near access driveways when placement in right-of-way is not practical.

- F. Meters may not be placed within sidewalks or pedestrian travel pathways except in cases where obstructions or other design standard requirements prevent the meter box from being placed behind the sidewalk or in a landscape strip (where a landscape strip is present). In such conditions, the meter box shall be placed in the sidewalk such that the edge of the meter box closest to the roadway is no closer than 6-inches to the adjacent edge of sidewalk. A minimum of 2-inches shall be maintained between meters boxes. Domestic water meter sizing calculations shall be per the most recent adopted Uniform Plumbing Code and will be provided by the Developer when requested. The length of the service between the meter and the structure shall not exceed one hundred fifty feet (150').
- G. When installing multiple services to a public main, a minimum spacing of two feet (2') shall be used between corporation stops, a minimum spacing of five feet (5') shall be used between corporation stops and tapping tees, and a minimum spacing of ten feet (10') shall be used between tapping tees.
- H. Domestic water services shall be connected to a looped distribution main unless otherwise approved by the City.

7.01.2.2 Other Services

Irrigation and other non-domestic water services shall meet all the above requirements as well as the following:

- A. An Irrigation meter shall be installed in cases where water is used for landscape purposes by non-single family customers and does not enter the sanitary sewer system.
- B. Upon City approval of a water permit application, a sewer deduct meter may be installed between the domestic water meter and the point of connection for an approved industrial/commercial use where the water does not enter the sanitary sewer system.
- C. For fire sprinkler service line requirements, see Section 7.01.6.2.
- D. Cross connection control devices shall be installed per Section 7.01.4.

7.01.3 Water Valves

Water valves shall meet the following requirements:

See Standard Details W-17 through W-19.

7.01.3.1 Water Valve Sizing

- A. A. Water valves shall be of the resilient wedge gate variety. Valves larger than 12" require the valve to be turned with a gear to maintain minimum cover.

7.01.3.2 Water Valve Location

- A. Water valves shall be installed along the water mains at a maximum spacing of four hundred feet (400') and at the intersection of lateral lines. A maximum of 20 service connections between valves shall be maintained except on dead end

residential streets where up to 30 service connections between valves are allowed.

- B. Water valves shall be located in clusters when possible and shall be located so that each leg of the main line system can be isolated separately.
- C. When extending public water mains, a water valve may be required near the end of lines where future extensions are projected.
- D. Water valves should not be placed within the wheel path of vehicle traffic.
- E. An all-weather maintenance road shall be provided within the public water utility easement to allow access to valves and other appurtenances located outside of the paved roadway.
- F. Valves shall be adjusted to final grade in accordance with **Standard Detail T-05**.

7.01.4 Cross Connection Control

See Standard Details W-22 through W25.

Water Systems shall be designed to protect the City water system from contamination via cross connection control in accordance with Washington State Law (WAC 246-290-490), Auburn City Code (ACC), the City's Cross Connection Control Program manual, and these design standards. Premises isolation shall be provided on service connections in accordance with these standards.

7.01.4.1 Domestic Services

- A. A Reduced Pressure Backflow Assembly (RPBA) shall be installed on all non-single family service connections.
- B. The RPBA assembly shall be installed adjacent to the meter or at an alternate location where the service line enters the building. RPBA assemblies installed at an alternate location require the approval of the City, and shall have no connections between the meter and the assembly.

7.01.4.2 Irrigation Services

- A. A backflow prevention assembly shall be installed on all irrigation service connections. The layout of the backflow prevention assembly shall be per **Standard Detail W-06** for single family residential services up to 2-inches and per **Standard Detail W-20** for non-single family residential services. The minimum level of backflow prevention required shall be provided by a Double Check Valve Assembly (DCVA) per **Standard Detail W-24**. A higher degree of protection may be required if deemed necessary by the City Engineer, which may include a Reduced Pressure Backflow Assembly (RPBA) per **Standard Detail W-22**.
- B. The backflow prevention assembly shall be installed adjacent to the meter.

7.01.4.3 Fire Line Connections

- A. A backflow prevention assembly shall be installed on all fire service connections. The layout of the backflow prevention assembly shall be per **Standard Detail W-09** for single family residential services up to 2-inches and per **Standard**

Detail W-20 for non-single family residential services. The minimum level of backflow prevention required shall be provided by a Double Check Valve Assembly (DCVA) per **Standard Detail W-24**. A Double Detector Check Valve Assembly (DDCVA) shall be installed on all fire line service connections 3-inches or larger. A higher degree of protection may be required if deemed necessary by the City, which may include a Reduced Pressure Backflow Assembly (RPBA) per **Standard Detail W-22**.

- B. The assembly shall be located on the service line between the main and the building or within the building riser room.

7.01.4.4 General

- A. A DCVA shall be installed to provide adequate access for inspection, testing and maintenance.
- B. A DCVA located outside the building shall be installed in a vault, as described on **Standard Detail W-24**.
- C. A DCVA located inside the building shall be installed per **Standard Detail W-25**.
- D. An RPBA shall be installed in an above ground enclosure or at alternate location with no connections between the meter and assembly (**see Standard Detail W-23**). An RPBA is required for all services utilizing chemicals.
- E. Prior to installation, two (2) sets of backflow prevention assembly plans, including the connection point to the City main, shall be submitted for review and approval by the City.
- F. Only assemblies listed on the current list of Backflow Prevention Assemblies Approved for Installation in Washington State shall be allowed. This list is maintained by the State of Washington and is available from the City.

7.01.5 Pressure Reducing Stations

See Standard Details W-10. Through W-12b.

A Pressure Reducing Station shall be installed as required between pressure zones to maintain adequate pressure in the water system. Isolation valves are required upstream and downstream of the station. Contact the City Water Utility Engineer for specific requirements when applicable. Water system design shall be done so as to minimize the number of pressure reducing stations necessary.

7.01.6 Fire Systems

7.01.6.1 Fire Hydrant Assemblies

See Standard Details W-07 & W-08.

Fire Hydrant Assemblies shall meet the following requirements:

- A. Fire hydrant assemblies shall conform to the standard details listed above.
- B. Fire hydrant service lines shall be installed at right angles to eight-inch (8") minimum diameter supply mains.

- C. Fire hydrants shall stand plumb, be set to meet manufacturer's specification for ground bury line, and have a clear, level area around the hydrant with a radius of no less than sixty inches (60").
- D. Fire hydrants shall be located no closer than fifty feet (50') to the surrounding structures, or at a distance as determined by the Fire Marshal and approved by the City Engineer. Fire hydrants shall be located such that no portion of the fire hydrant is within 5 feet of any portion of a driveway (including throat, apron, and wings).
- E. Fire hydrants shall be provided with two 2-1/2" National Standard Thread (NST) hose ports and one 4-1/2" NST by 5" hose port with a Storz adapter and cap.
- F. The pumper port shall face the street or fire access road and be readily accessible to any fire vehicle for firefighting and pumping operations. There shall be at least 18 inches clear from the face of the pumper port to the edge of pedestrian or traveled ways.
- G. The service line from the supply main to the fire hydrant shall be six inches (6") in diameter unless the service line extends over fifty feet (50') in length, in which case the service line shall be eight inches (8") in diameter.
- H. Fire hydrants shall be installed with a maximum spacing of six hundred feet (600') along streets in single-family zones and three hundred feet (300') in all other zones.
- I. Buildings, other than single-family residences, located with portions of the building more than one hundred fifty feet (150') in vehicular travel from a fire hydrant assembly or with building fire flow over 2500 gpm shall require on-site fire hydrant assemblies. These hydrants shall be served by a public water main that loops around the building, or complex of buildings, and reconnects back to a distribution supply main.

7.01.6.2 Fire Sprinkler Systems

Fire Sprinkler Systems shall meet the following requirements:

- A. Fire sprinkler systems shall be required in commercial/industrial and multifamily buildings according to the current fire code regulations. Sprinkler systems may be required in single-family residences when determined by the City and the Fire Authority.
- B. Fire sprinkler supply lines for commercial buildings, unless designed by a Fire Protection Engineer, shall be the same diameter as the supplying water main.
- C. Fire sprinkler supply lines shall be separated from the public water main by a valve located at the point of connection.
- D. The design of fire sprinkler supply lines for single-family/duplex shall be in accordance with **Standard Detail No. W-09**.
- E. A Washington State Certified Level "U" contractor shall install underground fire sprinkler supply lines in accordance with WAC 212-80-010. Prior to installation, four (4) sets of underground fire sprinkler supply line plans shall be submitted to the City for approval by the Fire Marshal. Both a State Certified Level "U" contractor and a Fire Protection Engineer shall stamp these plans. A letter from a state certified sprinkler system designer stating "FOR DESIGN PURPOSES ONLY" may be attached in lieu of a stamp from the Fire Protection Engineer.

- F. A post indicator valve (PIV) shall be installed on the fire sprinkler supply line between the public water main and the building. PIV's shall be located in such a manner as to be easily visible to Fire Department personnel. A wall-mounted PIV may be installed when the exterior wall of the building is of non-combustible construction. A detail containing this information shall be included with the submitted plans.
- G. Fire Department Connections (FDC's) shall be placed within fifty feet (50') of a fire hydrant or as directed by the Fire Marshal.
- H. Fire line taps shall have valves on both sides of the tee to ensure uninterrupted service.
- I. Fire sprinkler supply lines require the installation of detector check meters.
- J. Fire sprinkler systems shall have backflow prevention in accordance with Section 7.01.4.

7.01.6.3 Fire Flows

New developments or redevelopment of existing sites are required to meet the minimum City fire flow requirements listed below. The developer shall provide information to the City to define the building specific fire flow requirements. If the building specific fire flow requirements are greater than the minimums listed below, facilities shall be designed to meet the greater requirement.

The minimum fire flow requirements are as follows:

- | | |
|---------------------------------------|---------------------|
| 1) Single Family Residential | 1,500 GPM @ 2 Hours |
| 2) Industrial/Commercial/Multi-Family | 2,500 GPM @ 3 Hours |

Developers are responsible for installing all facilities necessary to serve their property, complying with development standards, and providing the required fire flow established by the Fire Marshal. If off-site water system improvements are necessary to meet these requirements, the Developer shall be responsible for said improvements. The change of use of existing structures or areas may also require the installation of new facilities.

7.01.6.4 Fire Authority and Hydrant Access

Fire Authority and hydrant access shall meet the following requirements:

- A. Access roads shall be a minimum of twenty feet (20') wide with a minimum vertical clearance of thirteen and a half feet (13½').
- B. Turns in the access road shall be designed using a minimum inside radius of twenty-eight feet (28') and a minimum outside radius of forty-eight feet (48').
- C. Private access roads that exceed one hundred fifty feet (150') in length and do not return to a public road shall be provided with a turnaround with a diameter of sixty-five feet (65').
- D. On sites where the primary access may become blocked, a secondary access road that is for emergency vehicles only may be required.

7.02 Public Water Utility Easements

Public Water Utility Easements are required for the placement, operation, and maintenance of water facilities upon private property.

Public Water Utility Easements shall meet the following requirements:

- A. Public Water Utility Easements shall extend a minimum of seven and one-half feet (7½') to each side of the centerline of the main, water meters 3 inches (3") and larger, and all fire hydrants. Public Water Utility Easements shall extend a minimum of two and one-half feet (2½') to each side of the centerline of water meters two inches (2") and smaller. Easements shall extend a minimum of seven and one-half feet (7½') either side of the vault walls of pressure reducing stations. Additional easement area may be required for facilities constructed in areas of steep terrain or at greater depths.
- B. Public Water Utility Easements shall be provided on the City's standard easement form. Legal description of the easement and the property that the easement encumbers, along with a sketch showing both, shall be stamped and signed by a licensed land surveyor and incorporated into the easement form as exhibits. The legal descriptions and sketch shall be on plain bond paper with margins acceptable to the County of recording.
- C. Public Water Utility Easements shall be reviewed by the City and then recorded in the appropriate County prior to acceptance of the public water main.

7.03 Material Requirements for Water Systems

Unless otherwise approved by the City, all water mains shall be constructed using Special Class 52 Cement Lined Ductile Iron Pipe having standard asphaltic coating on the exterior and cement-mortar lining on the interior. The list of acceptable valves, fittings, and other appurtenances for water facility construction is subject to change as new and improved components become available. Please refer to the City of Auburn's Construction Standards manual (latest edition) for the most current information on these requirements.

Chapter 8 Sanitary Sewer Facilities

8.00 Preface

The design of sanitary sewer facilities shall be in conformance with the applicable sections of the State of Washington Department of Ecology's "Criteria for Sewage Works Design" manual (DOE Manual) unless modified herein. These standards are set forth as a minimum requirement for the planning and design of gravity sanitary sewer facilities. Sewage pump stations and special facilities are not included within this design manual due to the complexity of these facilities. When designing pump stations and special facilities, please contact the City of Auburn Engineering Services for specific requirements.

Compliance with these standards does not alleviate the design engineer from using sound professional engineering practices. The design criteria contained herein are the minimum acceptable under standard conditions. Special conditions may require more stringent requirements that will be addressed during the plan review process.

The City's Comprehensive Sanitary Sewer Plan establishes drainage basins and design parameters used to estimate future line capacities. Anyone proposing to extend or modify the City's sanitary sewer system should contact the Community Development & Public Works Department for information on proposed line sizes and locations. Sanitary sewer improvements shall be constructed by means of a Facility Extension Agreement (FAC) between the developer and the City. The Community Development & Public Works Department can provide information on this agreement as well as applicable permit and connection fee estimates.

8.01 Design Criteria

8.01.1 Sanitary Sewer Mains

The design of sanitary sewer mains shall meet the following requirements:

8.01.1.1 Sanitary Sewer Main Sizing/Slope

Public sanitary sewer mains shall be designed using the following criteria:

- A. All sanitary sewer mains shall be a minimum of eight inches (8") in diameter.
- B. All new lines shall be sized as indicated in the City's current Comprehensive Sewer Plan. . For lines not specified in the plan, the applicant must design the line with sufficient capacity to convey any future upstream flows (based on current land use designations).
- C. Sanitary sewer mains should be designed and constructed to provide a minimum cleaning velocity of two feet per second (2 ft./s) when flowing at eighty percent (80%) full. If at final build out the planned contributing area will not achieve this capacity, additional provisions may be required.

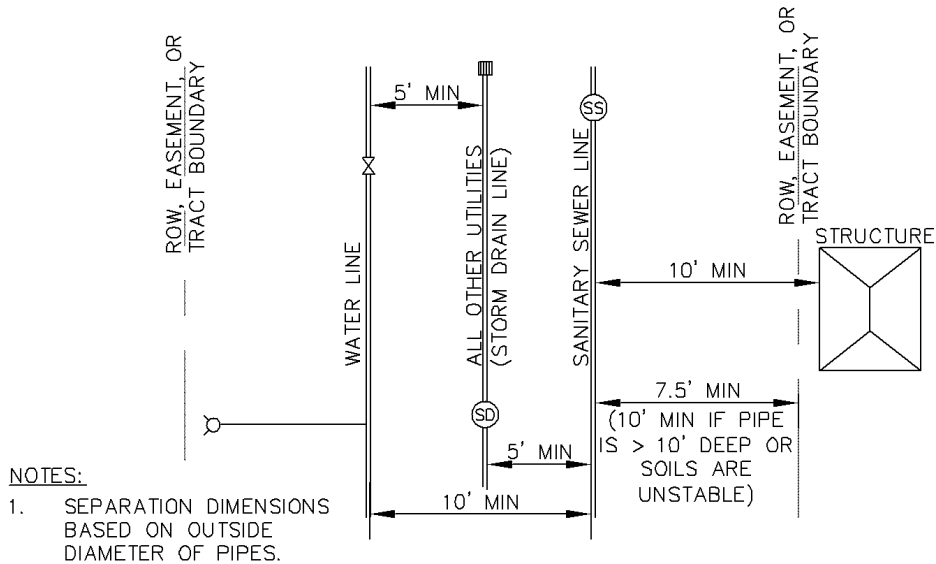
D. The following are the minimum slopes for the corresponding pipe sizes:

Pipe Size	Minimum Slope
8"	0.50%
10"	0.30%
12"	0.25%
18"	0.15%

8.01.1.2 Sanitary Sewer Main Location

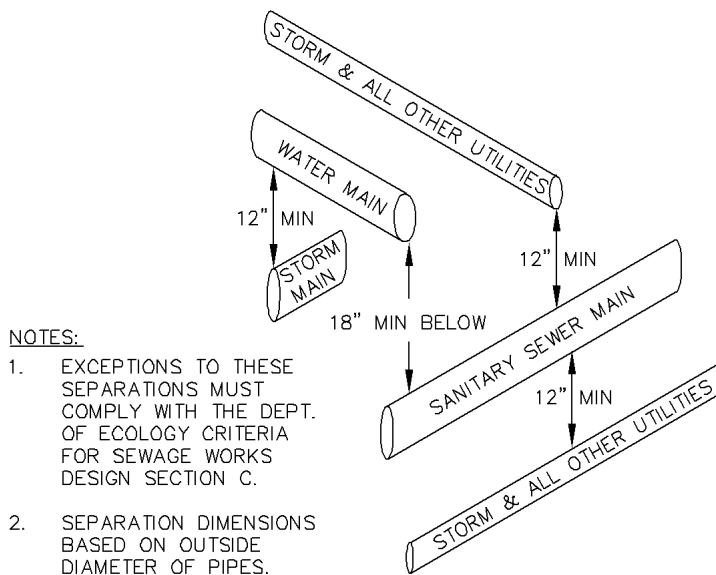
- A. The desired installation depth for sanitary sewer mains is between six feet (6') and fifteen feet (15') below the finished surface elevation. For mains less than 6 feet deep and over 15 feet deep, additional provisions may be required by the City.
- B. Sanitary sewer mains shall be located in the public right-of-way or within a public sanitary sewer utility easement. Sanitary sewer mains located in the public right-of-way shall meet the requirements of Section **9.01.2**.
- C. When the potential exists to serve upstream properties, sanitary sewer mains shall extend through the property being served or across the entire length of the lot frontage.
- D. The placement of new sanitary sewer mains shall be done in a manner that allows such lines to be readily repaired and/or replaced without impacting other adjacent facilities or structures in the vicinity. Sanitary sewer mains shall be located a minimum horizontal distance of ten feet (10') from structures and water mains and a minimum horizontal distance of five feet (5') from all other underground utilities. . The minimum separation distance is measured from the outside wall of each pipe. **(See Figure 8-01)**

Figure 8-01 Horizontal Pipe Separation



- E. If soil conditions are poor and/or the sanitary sewer main is deeper than 10 feet, the horizontal distance from structures may be increased. Minimum pipe clearances shall be measured from the outside wall of the pipe(s).
- F. At crossings between utilities, sanitary sewer mains shall be located a minimum vertical distance of eighteen inches (18") below water mains, and a minimum vertical distance of twelve inches (12") from all other underground utilities. The minimum separation distance is measured from the outside wall of each pipe/conduit. **(See Figure 8-02).** If the minimum vertical separation cannot be achieved, additional design provisions may be required by the City.

Figure 8-02 Vertical Pipe Separation



8.01.2 Sanitary Sewer Manholes

Sanitary sewer manholes shall meet the following requirements:

8.01.2.1 Sanitary Sewer Manhole Type and Size

A. Manholes shall be constructed per the following:

Sewer Manhole (48-inch to 60-inch)	WSDOT Standard Plan B-15.20 with an eccentric cone
Sewer Manhole (72-inch to 96-inch)	WSDOT Standard Plan B-15.40 with a flat top instead of riser

- B. Shallow sanitary sewer manholes (32"-48" deep) shall conform to City of Auburn Standard Detail S-066 and may only be used upon approval of the City Engineer.
- C. The City may consider sanitary sewer manholes over twenty (20') deep and/or greater than sixty inches (60") in diameter on a case-by-case basis, and additional design provisions may be required by the City.
- D. Sanitary sewer manhole diameters shall meet the following requirements based on the manhole depth and the size, number, and configuration of pipes entering:

Manhole Diameter	Number & Diameter of pipes/ Connections Allowed	Depth of Manhole
48" Diameter	1 Pipe, 21" 2 Pipes, 12" – 18" 3 Pipes, 8" – 10"	4' Minimum 12' Maximum
54" Diameter	1 Pipe, 36" 2 Pipes, 21" – 30" 3 Pipes, 12" – 18" 4 Pipes, 8" – 10"	6' Minimum 15' Maximum
60" Diameter	1 Pipe, 42" 2 Pipes, 24" – 36" 3 Pipes, 15" – 21" 4 Pipes, 10" – 12" 5 Pipes, 8"	8' Minimum 20' Maximum
72" Diameter	1 Pipe, 48" – 54" 2 Pipes, 36" – 42" 3 Pipes, 18" – 24" 4 Pipes, 12" – 15" 5 Pipes, 8" – 10"	8' Minimum 25' Maximum

Pipes entering manholes must have a minimum of 8 inches between their penetrations on the inside of the manhole. (See Detail S-08)

- E. The angle between inlet pipes and the outlet pipe shall not be less than 90-degrees.
- F. Drop manholes are discouraged. When necessary, drop manholes shall be inside drops conforming to City of Auburn Standard Detail S-05.

8.01.2.2 Sanitary Sewer Manhole Locations

The design of new sanitary sewer conveyance systems shall be done in a manner that minimizes the total number of manholes using the following criteria:

- A. Sanitary sewer manholes shall be installed at a maximum spacing of four hundred feet (400') apart along the main.
- B. Sanitary sewer manholes shall be installed at all junctions of two or more sanitary sewer mains.
- C. Sanitary sewer manholes are required whenever connecting to a sanitary sewer main with an eight-inch (8") or larger diameter pipe.
- D. Sanitary sewer manholes shall be installed at all changes in vertical slope, horizontal direction, and/or pipe size.
- E. Where the slope of a pipe entering or exiting a manhole is greater than five (5) percent, the slope shall be continued through the manhole and the invert elevations indicated on the plans.
- F. In cases where a sewer main steeper than five (5) percent must turn 90-degrees through a manhole, install a transition manhole at least 20 feet upstream to reduce the pipe slope to a maximum of 2 percent and/or to change the angle to 45-degrees.
- G. All public sanitary sewer lines shall end with a manhole. All end of the line sanitary sewer manholes with no side sewers connected directly to them shall conform to City of Auburn Standard Detail S-07.
- H. Sanitary sewer manholes are not to be located within the limits of surface water ponding or flow lines associated with stormwater runoff.
- I. Sanitary sewer manholes shall be located outside the wheel paths of roadways and driveway approaches.
- J. Sanitary sewer manholes shall not be located within sidewalks, trails, or curb and gutters.
- K. Sanitary sewer cleanouts are not an acceptable alternative for sanitary sewer manholes except they may be used with City approval at the end of a sanitary sewer main when the future extension of the sanitary sewer main is planned and the current end point is not a practical location for a manhole. When approved by the City, public cleanouts shall conform to City of Auburn Standard Detail S-03.
- L. Sanitary sewer manholes shall not be located on portions of streets or access roads with a slope greater than 6-percent.

8.01.2.3 Sanitary Sewer Manhole Parameters

- A. Sanitary sewer manholes shall provide a minimum of one-tenth of a foot (0.10') of drop between the inlet pipe and the outlet pipe. Pipes of differing diameters shall be aligned so that the crowns of the pipes match.
- B. Manholes are to be channeled from the entering pipe to the outlet pipe, with the sidewalls of the channel extended above the top of the largest connected pipe.

See Standard Detail S-08 When making a new connection to an existing manhole, the manhole shall be rechanneled to match the new pipe configuration..

- C. Sewer systems shall be designed so that there will be a minimum of 8-inches between pipe penetrations on the inside diameter of each manhole.
- D. Manholes set in gravel areas shall be set at the center of a six-foot (6') concrete apron flush with the finished grade.
- E. Manholes set in landscaped or unimproved areas shall be set six inches (6") to twelve inches (12") higher than the surrounding terrain and provided with a six-foot (6') diameter concrete apron around the manhole lid.
- F. Sanitary sewer manhole frames and covers shall conform to **Standard Detail S-04**.
- G. Sanitary sewer manholes shall be adjusted to grade per **Standard Detail T-05**.

8.01.3 Side Sewers

See Standard Details S-01, S-02 & S-03.

Side sewers are defined as that portion of the sewer system that extends from two feet (2') outside of the outer foundation wall of the structure to the public sanitary sewer main. The City owns and maintains the portion of the side sewer located within the right-of-way. The property owner owns and maintains the portion of the side sewer located outside of the public right-of-way. Side sewers located within easements are the property owners responsibility to maintain.

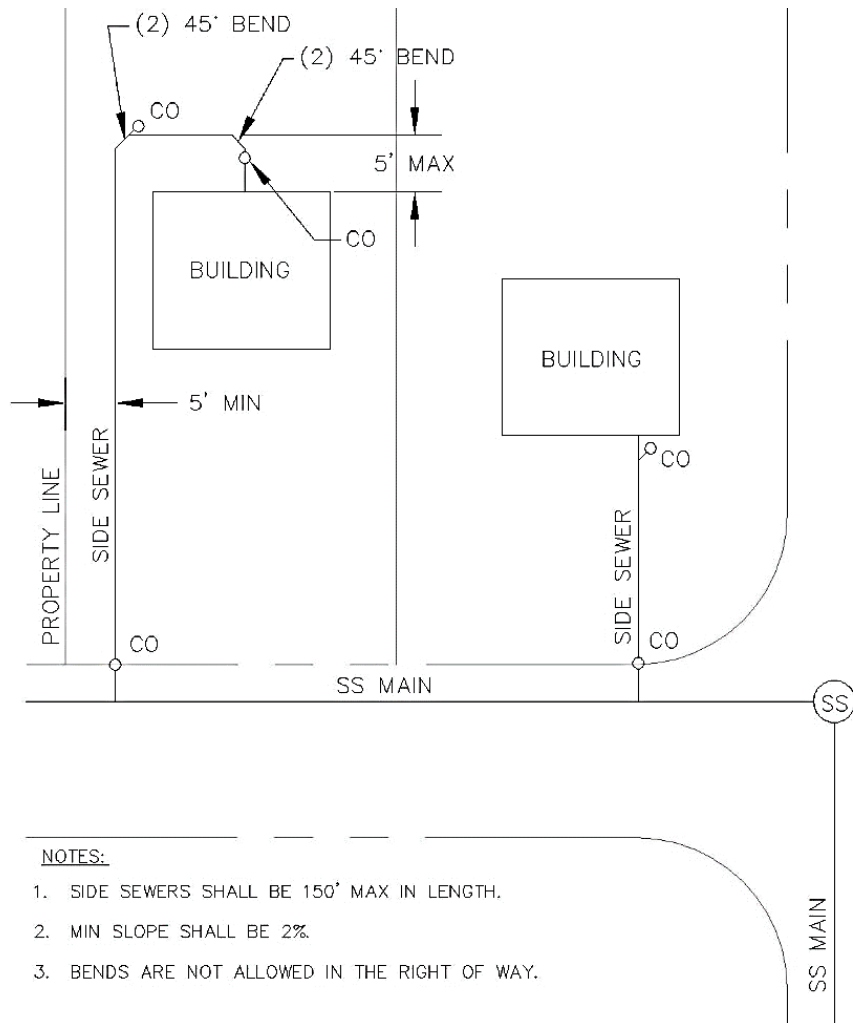
Side sewers shall meet the following requirements:

8.01.3.1 Side Sewer Parameters (See Figure 8-03)

- A. A separate and independent side sewer from the public main shall be provided for each and every parcel. A separate and independent side sewer from the public main shall be provided for each non-single family building on a parcel.
- B. Side sewers within the public right-of-way shall be a minimum of six inches (6") in diameter. The private portion of side sewers serving single family residences may be four inches (4") in diameter within the parcel that it serves.
- C. Six-inch (6") diameter side sewers shall be connected to the public sanitary sewer main by the use of a tee (Standard Detail S-01) or connected directly to a manhole located along the public main. All side sewer manhole connections shall incorporate a channeled or rechanneled manhole in conformance with Section 8.01.2.3.
- D. Side sewers with a diameter of eight inches (8") or greater shall be connected to the sanitary sewer system by use of a sanitary sewer manhole which shall be channeled or rechanneled in conformance with Section 8.01.2.3.
- E. When constructing sanitary sewer mains in new developments, side sewer installation shall extend from the connection on the main line to the edge of any utility easements or the public right-of-way, whichever is further.
- F. When installing new sanitary sewer mains or replacing existing mains in developed areas, side sewers shall be installed for all existing occupied structures and any buildable lots. Side sewers shall extend to the property lines and their location shall be clearly marked in conformance with City Standard Detail S-01.

- G. The maximum length of side sewer from the sanitary sewer main to the building shall not exceed one hundred and fifty feet (150').
- H. Side sewers shall be designed and constructed with a minimum two percent (2%) slope from the building to the tee or manhole connection. Where site constraints require that the slope be less than two percent (2%), the City may require larger diameter pipe and/or additional cleanouts.
- I. When an immediate connection to a building is not being made, side sewers shall be designed to provide a minimum depth at the property line of five feet (5') below the floor to be served or six feet (6') below the street, whichever is deeper. In cases of vacant properties with no anticipated building elevation, the side sewer shall be constructed at a two percent (2%) slope from the tee.
- J. Side Sewers shall not have horizontal or vertical bends located within the right-of-way.
- K. Side sewers shall have a minimum cover of five feet (5') at the edge of right-of-way.
- L. Side sewer cleanouts shall be installed within three feet (3') of the building foundation providing an access point into said line for future maintenance.
- M. Side sewer cleanouts shall be installed at the edge of the property owner's side of the public right-of-way line or utility easement where the ownership of the side sewer changes from private to public.
- N. Sanitary sewer cleanouts shall be installed in side sewers for each change in direction totaling ninety degrees (90°). **See Figure 8-03.**
- O. If the private portion of the side sewer crosses another private property other than the property being served, a minimum of a ten foot wide (10') private sewer easement (5 feet on either side of the pipe centerline) must be obtained granting the property owner being served permission to cross said property.
- P. All side sewers must use push on gasketed joints. Glued joints are not allowed outside the building footprint.

Figure 8-03 Side Sewer Layout



8.01.4 Oil/Water Separators

Prior to discharging into the sanitary sewer system oil separation facilities shall be used in pre-treating drainage flows from fuel islands, wash pads, and floor drains where (in the sole opinion of the City Engineer) heavy concentrations of oil may occur.

Design Criteria

Wash pads intended for washing the exterior surfaces of vehicles shall drain to a catch basin with a downturned 90-degree elbow prior to discharge to the sanitary sewer. Oil/water separators for other applications shall meet the following design criteria:

- A. A forebay to collect floatable and the larger settleable solids.
- B. A surface accessible inspection T inside the first chamber at the inflow pipe and a sample T at the last chamber at the outflow pipe.

- C. Access to the separator shall be maintained free for inspection at all times.
- D. A maximum of two hundred square foot (200 SF) of uncovered area open to rainfall may discharge to the separator.
- E. If a pump mechanism is required to convey the discharge from the site to the sanitary sewer system, the pump must be designed for discharge to a controlled gravity outlet flow into the City system.
- F. The separator shall have a valve on the discharge pipe that can be closed during cleaning and in the event of a spill.
- G. All piping entering and leaving the separator must be six inches (6") minimum diameter.
- H. Access points in the top of the separator vault must be provided to allow a minimum twelve-inch (12") diameter access for observation and maintenance to all chambers of the separator.
- I. Access doors shall be galvanized spring-assisted diamond plate with a penta-head bolt-locking latch and recessed lift handle.
- J. Access doors must open a full one hundred and eighty degrees (180°).

8.01.5 Sanitary Sewer Pumps

Low pressure force main sanitary sewer systems serving multiple parcels are not permitted within the City.

Individual sanitary sewer grinder pumps which serve one parcel may be allowed if the elevation of the sewer line and the building being served make service via a gravity line impossible. In these cases, sewage from the pressurized line from the pump must be discharged into a 6-inch diameter gravity side sewer prior to connecting to the public portion of the side sewer.

All other proposed pumping facilities require the City Engineer's approval and will be evaluated on case by case basis for conformance with the City's most recent Comprehensive Sewer Plan.

8.01.6 Sanitary Sewer Meters

The use of sewer meters shall only be allowed if it is determined by the City Engineer that a sewer meter is the appropriate device for the accurate measurement of wastewater being sent into the public sewer system.

8.02 Public Sanitary Sewer Utility Easements

Public Sanitary Sewer Utility Easements are required for the placement, operation, and maintenance of public sanitary sewers located within private property. Public Sanitary Sewer Utility Easements shall meet the following requirements:

- A. Public Sanitary Sewer Utility Easements shall extend a minimum of seven and one-half feet (7½') to each side of the centerline of the sanitary sewer main. Easements shall extend ten feet (10') to either side when the sanitary sewer main is over ten feet (10') deep or soil conditions are unstable. The width of the easement is intended to allow adequate space for performing maintenance, repair, and open cut replacements. In unusual circumstances (e.g., steep slopes) the City may require wider easements on a case-by-case basis.

- B. Public Sanitary Sewer Utility Easements shall be provided on the City's standard easement form. Legal description of the easement and the property that the easement encumbers, along with a sketch showing both, shall be stamped and signed by a licensed land surveyor and incorporated into the easement form as exhibits. The legal descriptions and sketch shall be on plain bond paper with margins acceptable to the County of recording. The easements may also be described and recorded on a final plat document.
- C. The City will record approved Public Sanitary Sewer Utility Easements in the appropriate County prior to acceptance of the public sanitary sewer facilities unless part of a final plat document.

8.03 Material Requirements for Sanitary Sewer Systems

The following is the City's list of required sanitary sewer pipe materials and depth criteria. Please refer to the City of Auburn's Construction Standards manual (latest edition) for the most current information on these requirements.

8.03.1 Sanitary Sewer Pipes

Pipe Type	Minimum Pipe Cover	Maximum Pipe Depth
Solid Wall Polyvinyl Chloride (PVC) Pipe, SDR-21	18 inches	22 feet
Solid Wall Polyvinyl Chloride (PVC) Pipe, SDR-35 (Requires 13.5' lengths.	3 feet	18 feet
Solid Wall Polyvinyl Chloride (PVC) Pipe, C900	12 inches	30 feet*
Sewer Safe Ductile Iron Pipe (Protecto 401 Ceramic Epoxy Lined)	6 inches	30 feet*

* Sanitary sewers below thirty feet (30') will require pre-approval of the City.

Chapter 9 Utilities

9.00 Preface

The design of public and private utilities located within City right-of-way shall be in conformance with these standards.

Compliance with these standards does not alleviate the design engineer from using sound professional engineering practices and meeting the requirements of the specific utility in question. The design criteria contained herein are the minimum acceptable under standard conditions. Special conditions may require more stringent requirements that will be addressed during the plan review process.

9.01 Design Criteria

The City has established the following minimum requirements to ensure the efficient construction of utilities with the least impact to City transportation and utility infrastructure.

9.01.1 Private Utilities Located Within City Right-of-Way

Unless otherwise provided in a public way agreement, franchise, or lease, a grantee, franchisee, or lessee with permission to occupy a public way must locate its cable or telecommunications facilities underground.

9.01.1.1 Private Utilities Located Underground

Private utilities located underground shall meet the following requirements:

- A. Private utilities shall be installed with no less than thirty-six inches (36") of finished cover.
- B. Private utility lines to be located within the City right-of-way will require prior approval from the City. These utility companies shall have a current franchise or public way agreement consistent with Title 20 and/or Title 13, if applicable, of the Auburn City Code.
- C. Private utilities shall be located a minimum horizontal distance of five feet (5') from buildings and public utilities.
- D. When crossing public utilities, private utilities shall be located a minimum vertical distance of twelve inches (12") from the public utility.

9.01.1.2 Private Utilities Located Aboveground

On projects where underground requirements do not apply, the following parameters will need to be addressed in locating aboveground utilities:

- A. Utility poles and other aboveground utility structures located on roads with a curb shall be installed a minimum of two feet (2') from the face of curb with the preferred location being at the edge of the right-of-way. For urban and rural roads where no curb is present, utility poles and other aboveground utility structures shall be located outside the clear zone in accordance with the AASHTO manual "A Policy on Geometric Design of Highways and Streets."

- B. Utility poles and other aboveground utility structures should not be located within the sidewalk. If this is not possible, their locations shall provide a minimum of forty-eight inches (48") of travel way to meet ADA requirements.
- C. Utility poles and other aboveground utility structures shall be compatible with driveways, intersections, and all other road features. They shall not interfere with sight distance, road signing, traffic signals, culverts, etc. This may require that existing poles be relocated at the developer's expense.
- D. No utility pole or other aboveground utility structures shall be located in such a way as to pose a hazard to the general public. Utility companies shall locate and replace poles and other structures with primary consideration given to public safety and roadway functionality.

When a developer-driven project requires the relocation of private utilities due to public utility extensions or other City required improvements, the cost of relocation of the private utility shall be borne by the developer.

9.01.2 Public and Private Utilities Located Underground Within City Right-of-Way

Any developer, utility, or other entity intending to trench in an existing City street shall contact the City of Auburn Community Development & Public Works Department and obtain a construction permit. A City permit must be obtained prior to any work within the City right-of-way.

Manholes, valve boxes, power vaults, etc., that are located in the paved area of a street shall be located outside of the wheel paths of vehicles and flush with the pavement surface. Structures located within parking lots, sidewalks, and paths/trails shall also be flush with the surface. In areas where traffic will pass over the structure, load-bearing lids shall be incorporated in the design.

Trenching, backfill, and restoration shall, within paved areas, be per **Standard Details T-01 and T-02**.

Repair of existing cement concrete roadway panels shall be per **Standard Detail T-27**.

Adjustment of utility structures to existing grade shall be per **Standard Detail T-05**.

9.01.2.1 Perpendicular (Transverse) Trenching in Asphalt Pavement

- A. Perpendicular trenching shall be in accordance to **Standard Detail T-01**.
- B. Pavement restoration shall match existing pavement type and thickness with a minimum thickness of 4-inches.
- C. In the process of perpendicular trenching, if the remaining section of pavement between the trench and the edge of the pavement/gutter is less than four feet (4'), the patch will extend from the trench to the edge of the road pavement.
- D. Perpendicular trenching to roadways may not be allowed on newer roads or streets that have been constructed or overlaid within the last five (5) years.
- E. Perpendicular trenching may not be allowed or may be limited to off-peak hours and/or weekends on principal arterials or where the construction activity will

seriously impede large volume traffic patterns. Utility connections that have to be made within the roadway will be allowed after approval from the City.

- F. Jacking/boring alternatives may be required as substitute methods for perpendicular trenching.
- G. The minimum pavement patch width and overlay restoration for perpendicular/transverse trenches shall be per **Standard Detail T-02**.
- H. When multiple trenches are required in close proximity, the asphalt patch shall encompass all the trenches.
- I. The longitudinal edge of the perpendicular asphalt patch shall not lie within the wheel paths of vehicles.

9.01.2.2 Longitudinal Trenching in Asphalt Pavement

- A. Longitudinal trenching shall be in accordance with **Standard Detail T-01**.
- B. Pavement restoration shall match existing pavement type and thickness with a minimum thickness of 4-inches.
- C. In the process of longitudinal trenching, if the remaining section of pavement between the trench and the edge of the pavement/gutter is less than four feet (4'), the patch will extend from the trench to the edge of the road.
- D. The longitudinal edges of the asphalt patch shall not lie within the wheel paths of vehicles.
- E. The minimum pavement patch width and overlay restoration for longitudinal trenches shall be per **Standard Detail T-02**.
- F. For streets that have been constructed or overlaid within the last five (5) years, principal arterials, or where open trenching will impede large volume traffic patterns, the City may require that trenching be limited to off peak hours and/or weekends or may require that jacking/boring be researched as an alternative.

9.01.2.3 Trenching in Concrete Pavement

Trenching in concrete pavements shall conform, where applicable, to the previous sections and the following:

- A. The edges of trenches in concrete pavement shall be sawcut prior to excavation to avoid damaging the slab. Concrete slabs six inches (6") and over shall be drilled for the installation of dowels. Dowels shall be one and one-quarter inches (1¼") in diameter, eighteen inches (18") long, and spaced twelve-inch (12") center to center.
- B. The minimum pavement patch width for concrete trenches shall be four feet (4').
- C. In the process of trenching concrete, if the section of pavement between the trench and the edge of the existing concrete panel is less than four feet (4'), the section will need to be removed and replaced.
- D. Longitudinal trenches in concrete may be repaved with an asphalt pavement thickness of equivalent strength upon City approval.

9.01.2.4 Trenching in Other Right-of-Way Surfaces

Trenching in other right-of-way surfaces, including sidewalks, gravel shoulders, and landscape strips, shall conform, where applicable, to the previous sections and replace the disturbed material in kind or as directed by the City. Utility trench bedding and backfill shall conform to **Standard Detail T-01** and to the Construction Standards.

Chapter 10 Streets

10.00 Preface

The intent of this chapter is to encourage the uniform development of an integrated and accessible public street system that will support present and future multimodal transportation. Through the implementation of these standards, streets are built as transportation facilities as well as public space, contributing positively to the character of an area. These standards help create an efficient multimodal transportation system with minimal environmental impact to the community.

The design of Streets within the City of Auburn shall conform to the standards provided herein. The latest additions of the American Association of State Highway and Transportation Officials (AASHTO) and the State of Washington Department of Transportation (WSDOT) standards shall be utilized by the City Engineer when the design standards, standard specifications, or standard drawings are not covered by the scope of the City's standards.

The design criteria used to estimate future street usage are established in the City's Transportation Plan. Anyone proposing to extend or modify the City's street system should contact the City of Auburn for information. Developers needing to construct street improvements shall enter into a Public Facility Extension Agreement (FAC). The City's Permit Center can provide the information on this agreement as well as applicable permit fee estimates.

It is provided, however, that notwithstanding any provisions to the contrary, all streets located within the Downtown Urban Center Zone boundaries as depicted on the Comprehensive Zoning Map, other than that area west of the BNSF Railroad right-of-way, shall be subject to the "Downtown Auburn Sidewalk Design Guidelines" (Guidelines). Should any conflict exist between the Guidelines and the design criteria, Chapter 10, of this document, the Guidelines shall control in those portions of the Downtown Urban Center Zone described above.

All streets shall be designed and constructed to comply with Federal Americans with Disabilities Act (ADA) laws. Additional guidelines and information can be found at WSDOT's ADA web page at: <http://www.wsdot.wa.gov/design/roadside/roadsideada.htm>.

10.01 Street Classification

All streets in the City of Auburn have been classified using the Federal Functional Classification system. A complete listing of all roads by classification is available from the Department of Community Development & Public Works.

The following section contains descriptions of the street classifications used in the City. **Table 10-1 (included at the end of Chapter 10)** contains information relating to each street's design requirements for widths, radii, typical speed limits, and other information. This section also contains typical cross-sections for each street classification. These cross-sections contain information on street layouts and widths of various street elements. Note that in the cross sections, the maximum slope of the bench area between the back of the sidewalk and any cut/fill slope shall be 3-percent. Roadway pavement sections shall conform to Section 10.07 of these design standards.

10.01.1 Arterials

Arterials are the highest level of City Street classification. They fall under the following two categories: Principal Arterial and Minor Arterial.

10.01.1.1 Principal Arterial

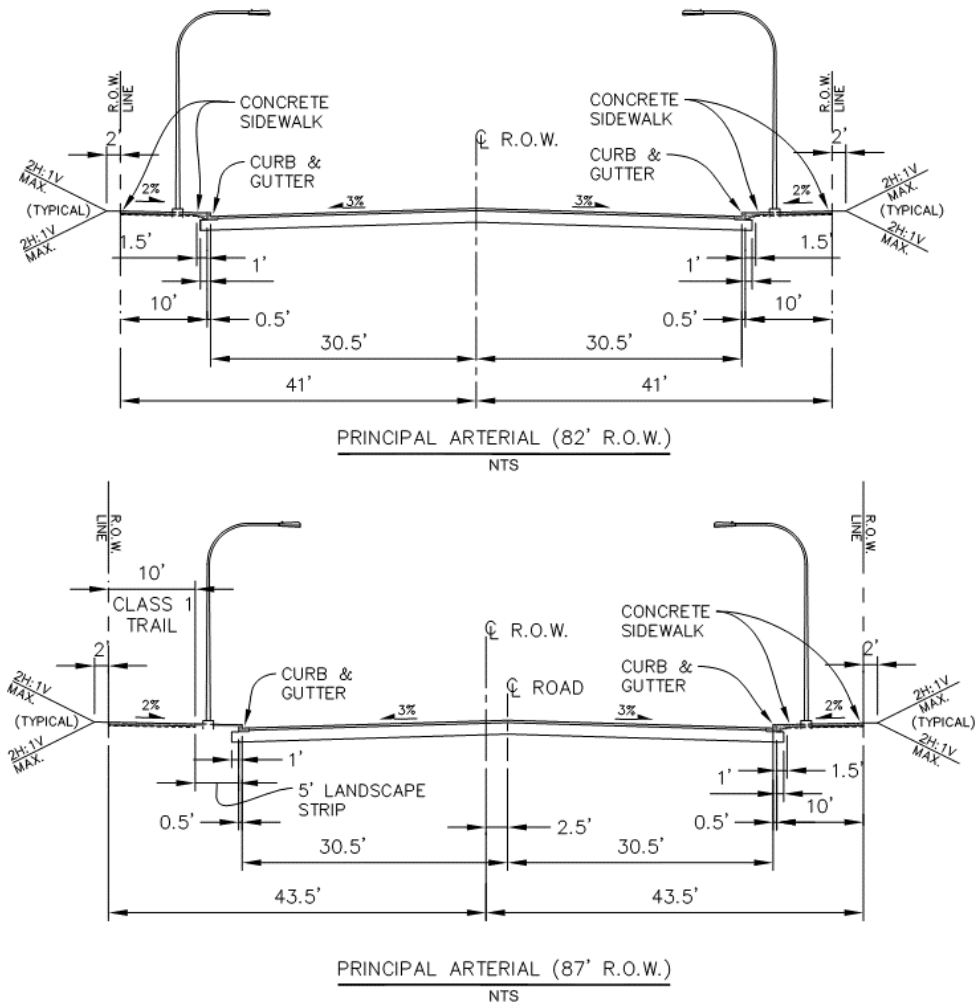
Arterials are the highest level of City Street classification. They fall under the following two categories: Principal Arterial and Minor Arterial

See Figure 10-01 below.

Principal Arterials are designed to move traffic between locations within the region and to access the freeways. Design emphasis should be placed on providing movement of inter-city through-traffic rather than intra-city traffic. Direct access to commercial and industrial land uses is permitted.

Principal Arterials are typically constructed to accommodate five (5) lanes of traffic with an operating speed of thirty-five to forty-five miles per hour (35-45 mph). The design year ADT is greater than 15,000 vehicles per day.

Figure 10-01 Principal Arterial Typical Cross Sections



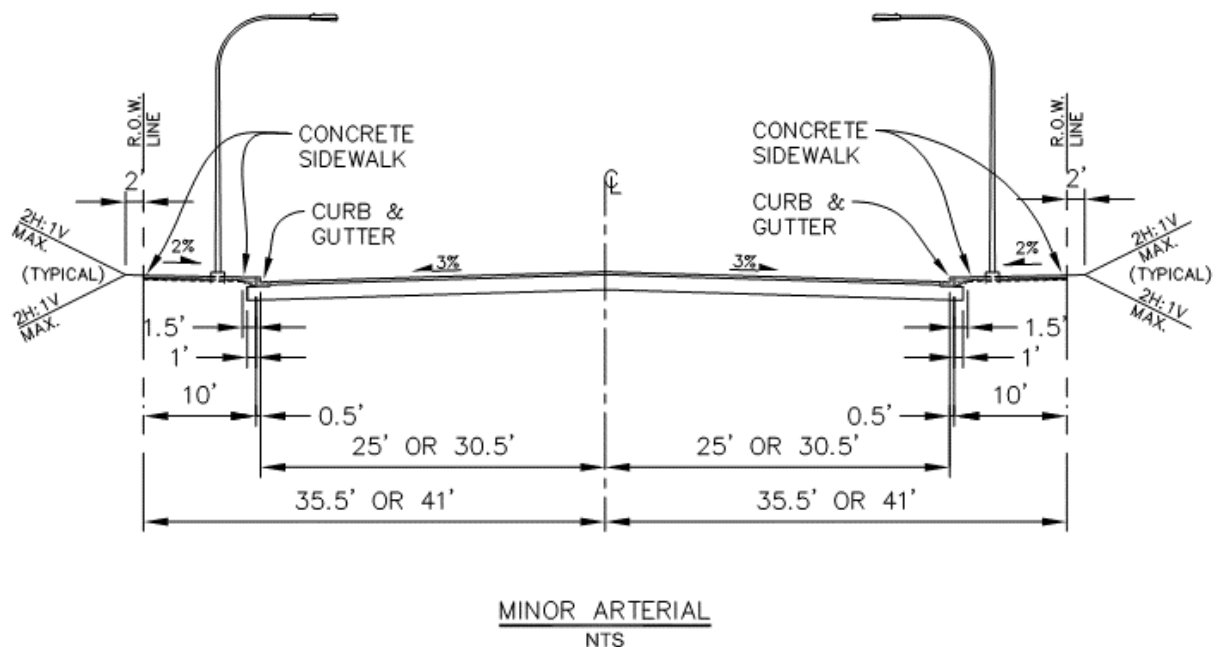
10.01.1.2 Minor Arterial

See Figure 10-02 below.

Minor Arterials should interconnect with and augment principal arterials and provide service to trips of moderate length at a somewhat lower level of travel mobility than principal arterials. The minor arterial street system includes all arterials not classified as a principal or collector and consists of facilities that place more emphasis on land access than the higher system and offers a lower level of traffic mobility.

Minor Arterials are typically constructed to accommodate four to five (4-5) lanes of traffic with an operating speed of thirty to thirty-five miles per hour (30-35 mph). They may serve secondary traffic generators such as community business centers, athletic fields, neighborhood shopping centers, major parks, multifamily residential areas, medical centers, large church complexes, hospitals, and traffic from neighborhood to neighborhood within the City. The design year ADT is 10,000 to 15,000 vehicles per day.

Figure 10-02 Minor Arterial Typical Cross Section



10.01.2 Collectors

Collectors are a step below Arterials in the City classification system. They fall under the following three categories:

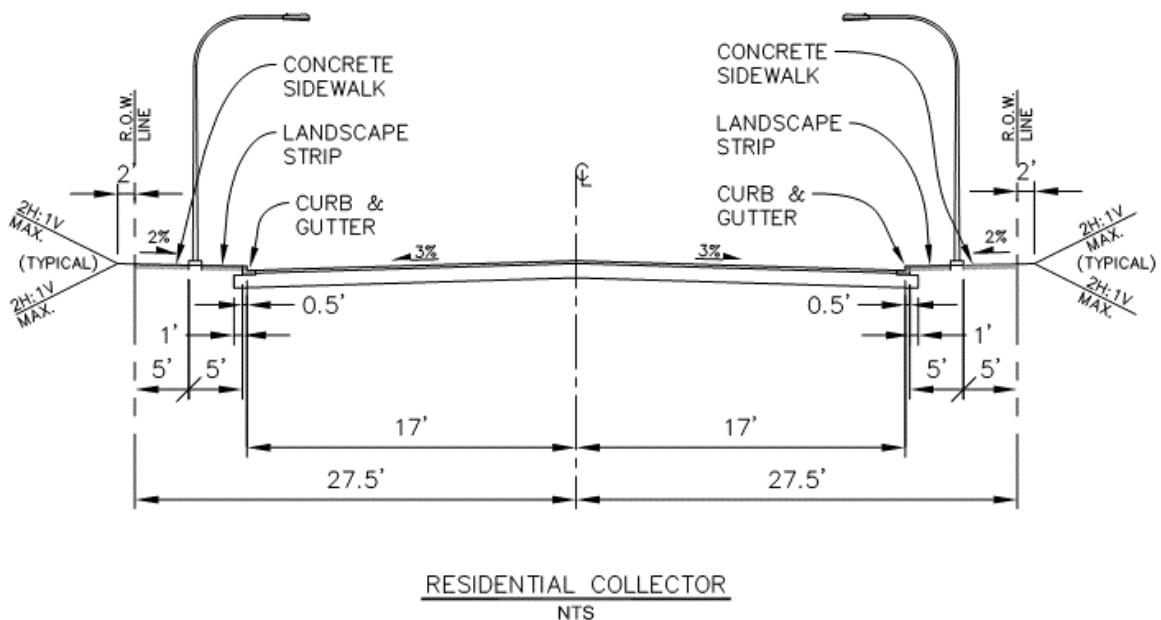
10.01.2.1 Residential Collector

See Figure 10-03 below.

Residential Collectors are used to connect intra-community streets, residential neighborhoods, commercial areas, industrial areas, and community centers to minor and principal arterials.

Residential Collectors are typically constructed to accommodate two (2) travel lanes and a two-way left-turn lane or two (2) travel lanes and bike lanes with an operating speed of thirty miles per hour (30 mph). The design year ADT is 2,500 to 10,000 vehicles per day.

Figure 10-03 Residential Collector Cross Section

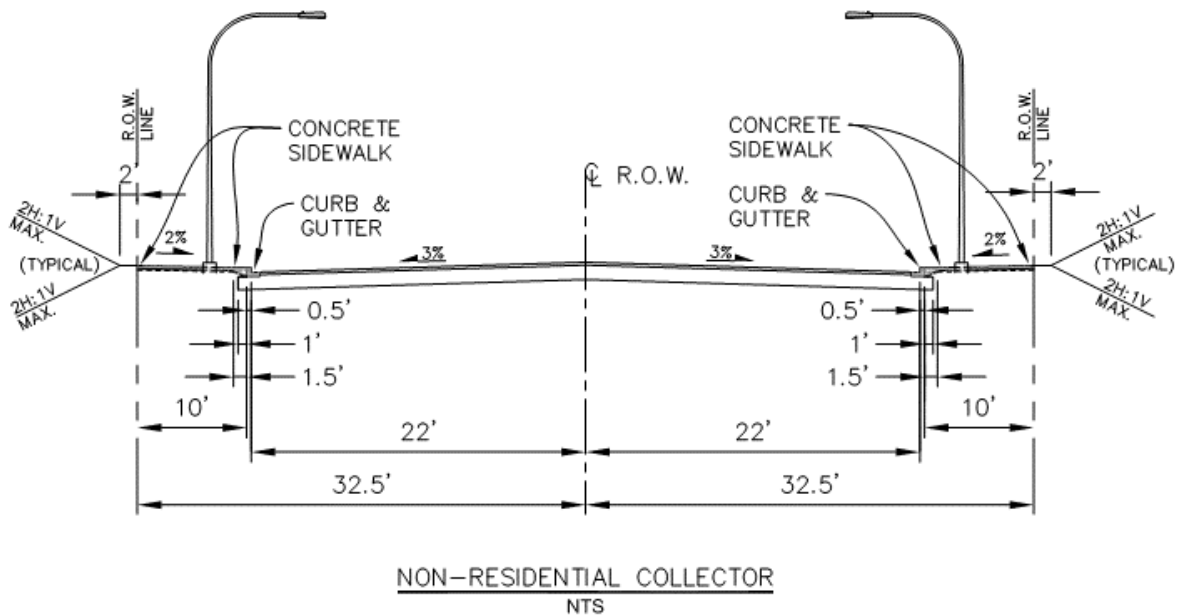


10.01.2.2 Non-Residential Collector

See Figure 10-04 below.

Non-Residential Connectors provide intra-community access connecting non-residential properties with activity centers and recreational facilities. Non-Residential Collectors are typically constructed to accommodate two (2) lanes and a center two-way left-turn lane, with an operating speed of thirty miles per hour (30 mph). They may serve neighborhood traffic generators such as one store or a small group of stores, elementary schools, churches, clubhouses, small hospitals or clinics, areas of small multifamily developments, as well as other commercial/industrial parcels. The design year ADT is 2,500 to 5,000 vehicles per day.

Figure 10-04 Non-Residential Collector Cross Section



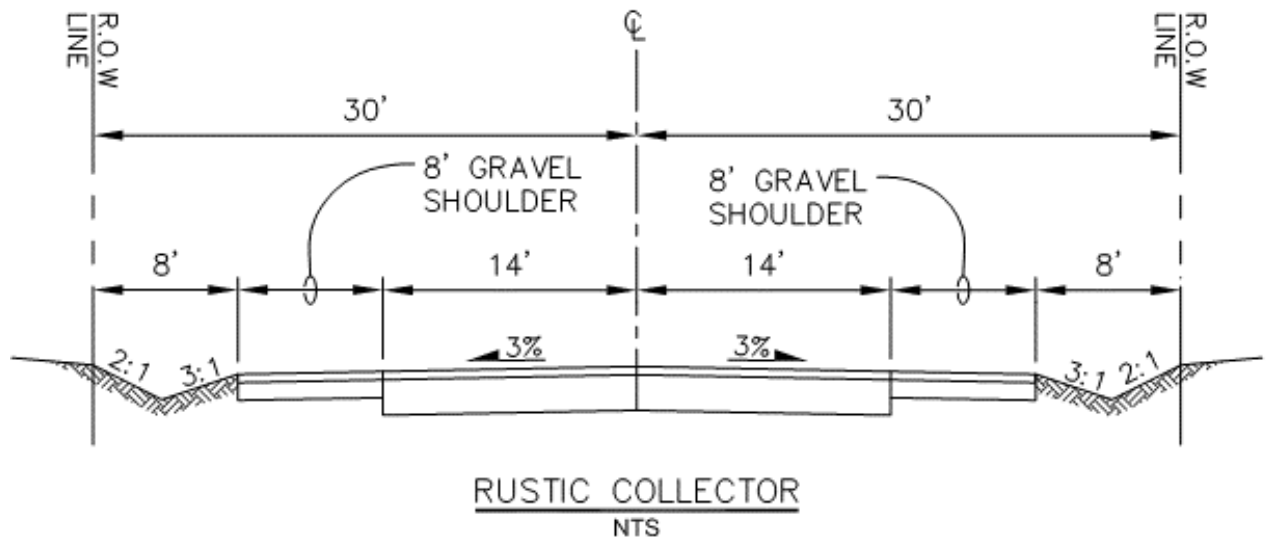
10.01.2.3 Rustic Collector

See Figure 10-05 below.

Rustic Collectors are routes that (regardless of traffic volume) the majority of travel distances are shorter than on arterial routes and residential neighborhoods to activity centers.

Rustic Collectors provide access to all levels of arterials, are typically constructed to accommodate two (2) lanes with gravel shoulders on both sides, and provide an operating speed of thirty to forty miles per hour (30-40 mph). The gravel shoulder may be reduced on one side to provide a wider shoulder on the other for equestrian access, with permission from the City Engineer. The design year ADT is 1,000 to 5,000 vehicles per day.

Figure 10-05 Rustic Collector Cross Section



10.01.3 Local Streets

Local Streets are the most common streets classified in the City. This classification can be broken up into four categories as follows:

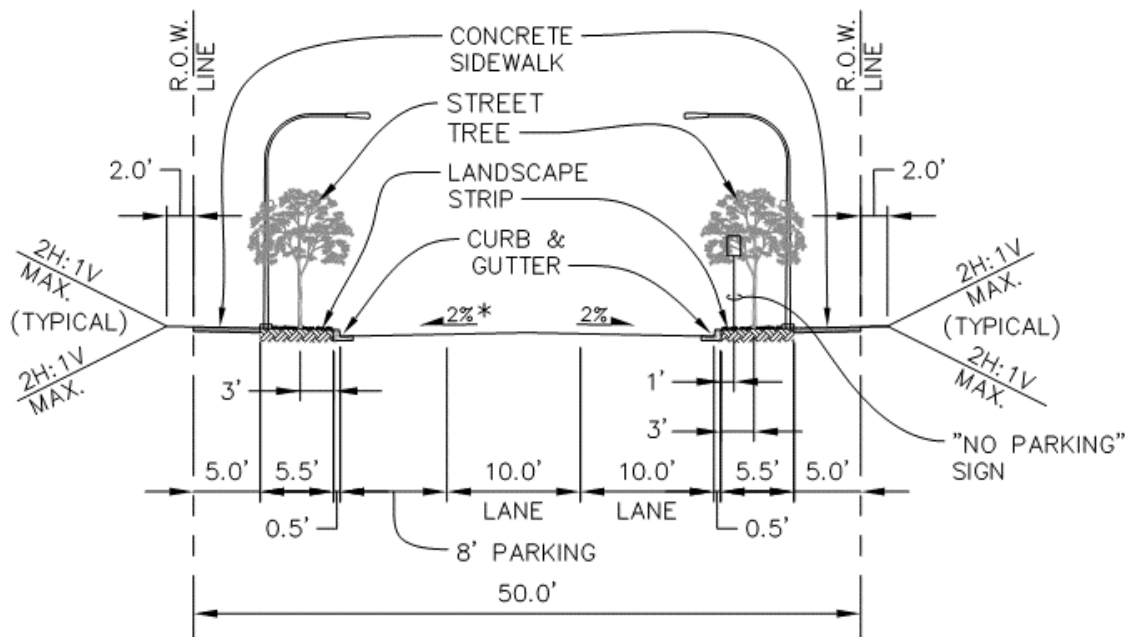
10.01.3.1 Local Residential

See Figures 10-06, 10-06A, and 10-06B below.

Local Residential streets provide access to abutting residential parcels. They offer the lowest level of mobility among all street classifications. The street is designed to conduct traffic between dwelling units and higher order streets. As the lowest order street in the hierarchy, the access street usually carries no through traffic and includes short streets, cul-de-sacs, and courts. Service to through traffic movement is discouraged and the street usually contains no transit bus routes.

Local Residential streets are typically constructed to accommodate two (2) lanes of traffic, on-street parking (one side only, the other side shall be signed "No Parking"), and an operating speed of twenty-five miles per hour (25 mph). The design ADT is up to 1,200 vehicles per day.

Figure 10-06 Local Residential Cross Section



* CROSS SLOPE MAY BE REDUCED TO 1%
FOR PERVIOUS/PERMEABLE PAVEMENT.

LOCAL RESIDENTIAL CROSS SECTION

NTS

Figure 10-06A Local Residential Cross Section – Alternate A

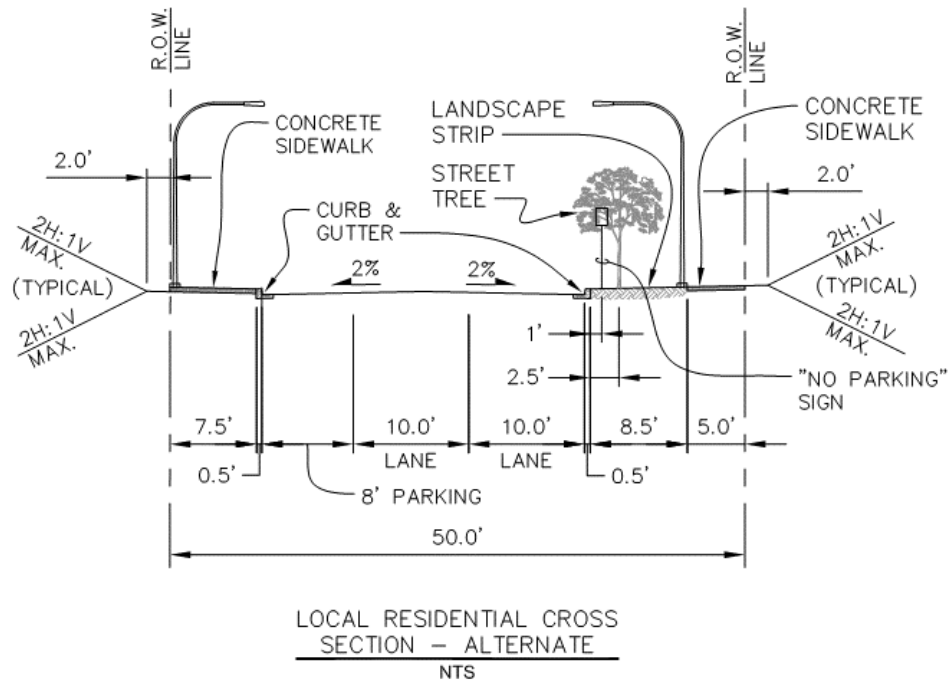
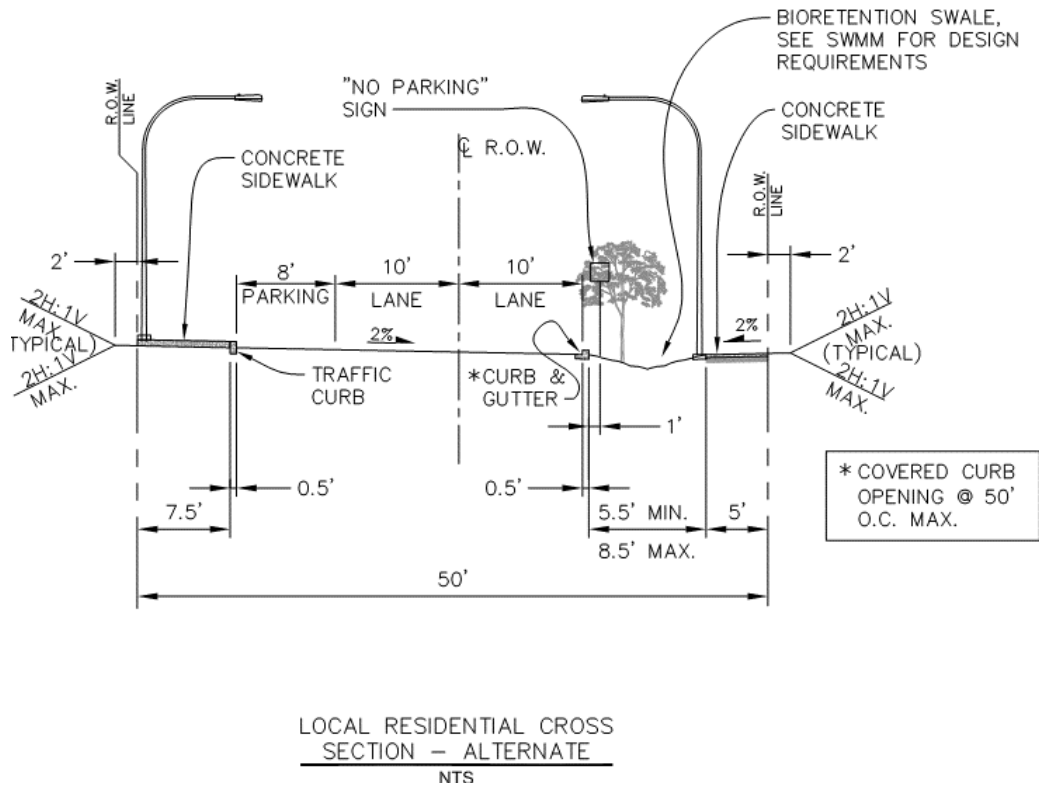


Figure 10-06B Local Residential Cross Section – Alternate B



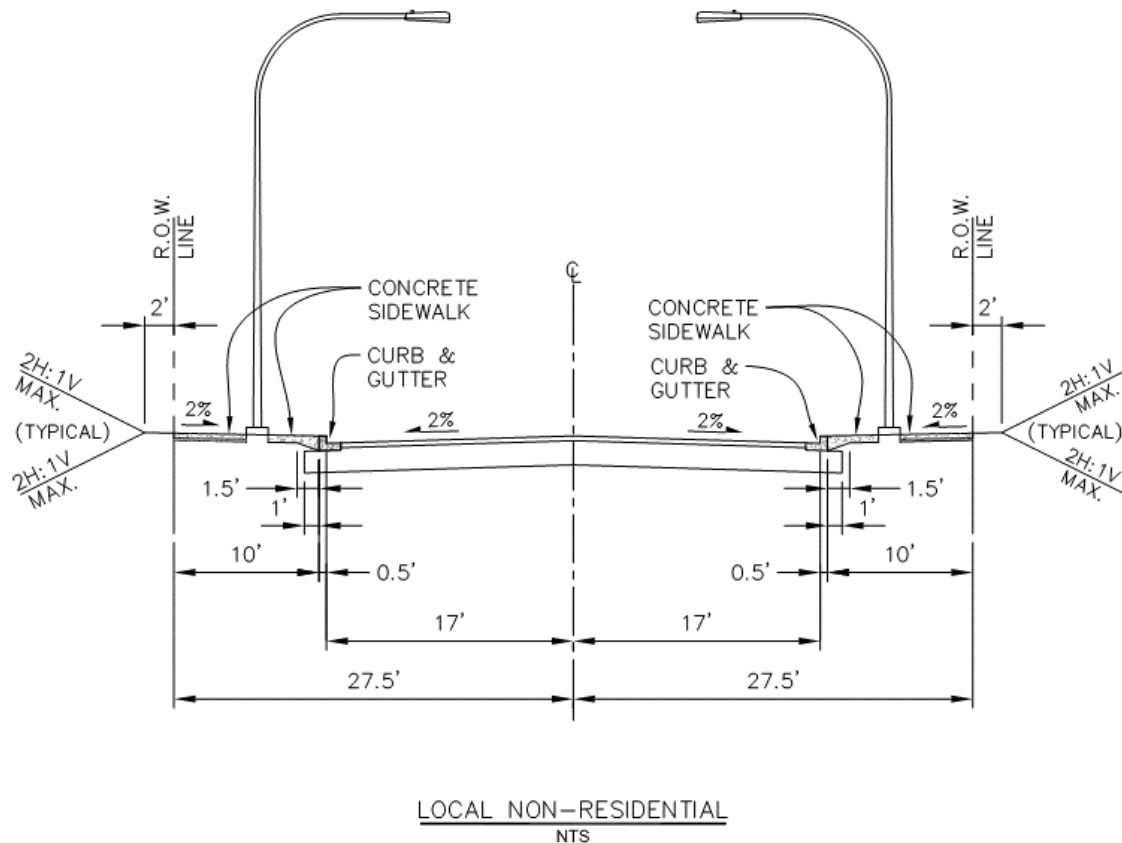
10.01.3.2 Local Non-Residential

See Figure 10-07 below.

Local Non-Residential streets provide direct access to higher order classification streets and serve primarily industrial/manufacturing land uses. They offer lower level of mobility and accommodate heavy vehicle traffic. Service to through movement is discouraged.

Local Non-Residential streets are typically constructed to accommodate two (2) lanes of traffic with an operating speed of twenty-five miles per hours (25 mph). The design year ADT is up to 1,200 vehicles per day.

Figure 10-07 Local Non-Residential Cross Section



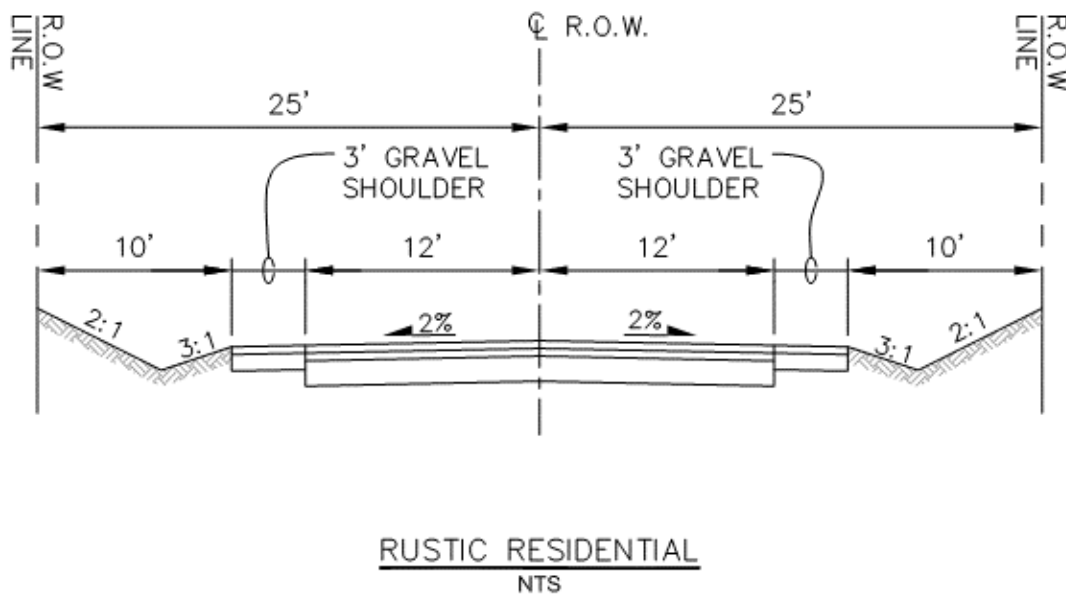
10.01.3.3 Rustic Residential

See Figure 10-08 below.

The Rustic Residential streets primarily provide access to the adjacent land and distribute traffic to and from the principal or minor arterials and local access streets. The travel distance is relatively shorter as compared to Rustic Collectors.

Rustic Residential streets are typically constructed to accommodate two (2) lanes of traffic with gravel shoulders on both sides and an operating speed of twenty-five miles per hour (25 mph). The design year ADT is up to 1,000 vehicles per day.

Figure 10-08 Rustic Residential Cross Section



10.01.4 Alleys

Alleys afford a secondary means of vehicular access to abutting property and are not intended for general traffic circulation. Dead-end alleys are generally unacceptable; however, where dead-end alleys are determined suitable by the City Engineer, for short term or temporary applications, they shall be provided with adequate turnaround facilities at the dead-end. All new alleys shall be private.

Alleys shall incorporate the design criteria used in designing local streets with the following exceptions:

- A. All new alleys shall have a minimum width of twenty feet (20') of asphalt pavement.
- B. Developments that generate four (4) or greater PM peak hour trips and have direct access to existing alleys are required to pave the alley to a width of twenty feet (20') along the frontage of the property and between the nearest property line and the public street that provides the City preferred travel path. If adequate right-of-way does not exist to provide the required twenty feet (20') of pavement adjacent to the property, the appropriate dedication of right-of-way shall be

required. Such dedication shall be equally apportioned from both sides of the alley, when feasible, as determined by the City Engineer. If adequate right-of-way does not exist to provide the required twenty feet (20') of pavement along the alley between the nearest property line and public street, the alley shall be paved to the width of the existing right-of-way.

- C. The pavement section for alleys located in non-single family zones shall be consistent with a local non-residential street standard.
- D. Curb and gutter, sidewalk, lighting, and landscaping are not required along alleys.
- E. Alleys may be paved with either a crown at centerline with asphalt wedge curbs on both sides to control drainage or be sloped to one side with an asphalt wedge curb on one side to control drainage. When necessary, storm drainage conveyance systems shall be installed along the alley to address storm drainage runoff from the paved surface.
- F. Alleys shall connect to City streets via a commercial driveway apron.

Alleys serving alley loaded lots shall include provisions for unimpeded vehicular circulation along the alley, and provisions for adequate sight distances along both the alley at driveways and at intersections with public streets.

10.01.5 Half Streets

A Half-Street could be comprised of any one of the above mentioned street classifications. Half-Streets require, at a minimum, the construction from one side of the street, including the curb and gutter, storm drainage, sidewalk, lighting, conduits, and landscape strip, to the street centerline. Half-Streets will need to be constructed when a proposed new development or redevelopment of a property is located on a public street that is not currently built to City standards. Half-Street construction may also be required for property that abuts future streets proposed in the City's Comprehensive Plan.

When Half-Street construction is required on an existing paved street, the design of the Half-Street shall be consistent with the existing street conditions. This could require construction of more than half the street for safety and drainage reasons.

When Half-Street construction is required on unpaved streets or unimproved areas, a minimum of twenty-four feet (24') of pavement will be required. In these cases, the street should be designed to provide drainage for the constructed portion of the street. Provisions shall be made to allow for extension of the storm drainage system to the undeveloped portion of the street for future construction.

The construction of a Half-Street may require the dedication of additional right-of-way. If a Half-Street does not connect at both ends to other streets, construction of a cul-de-sac will be required.

Where Half-Streets are connected to existing streets, transition tapers will be required when edges of pavement do not match. The following formula provides the information necessary to determine the length of the tapers for a specific situation:

For street design speeds of less than forty miles per hour (40 mph)

$$\frac{WS^2}{60} = L$$

W = the width of the pavement offset

S = the design speed in mph

L = the length of the taper

For street design speeds of greater than or equal to forty miles per hour (40 mph)

$$\frac{WS}{L} = L$$

W = the width of the pavement offset

S = the design speed in mph

L = the length of the taper

All required utilities located within the portion of the street being built, shall be installed during construction. Half-Street construction may also require the upgrading of existing utilities if said upgrading was necessary for the proposed development.

The unfinished side of the Half-Street shall be finished with temporary curbing, shoulders, clear zones, guardrail, slope treatments, and drainage accommodations to assure proper drainage, bank stability, and traffic safety.

When Half-Streets connect to an intersection, the nearest corner of the intersection on the side being improved shall be designed and constructed for the full build-out of the street. The intersection design and construction shall include adequate improvements to insure safe use by pedestrians, bicycles, and vehicles.

10.01.6 Private Access Roads on Access Tracts or Easements (Shared Driveways)

Access roads provided on access tracts or easements, also known as shared driveways, provide access for up to six (6) residential units on panhandle/flag lots and rear lots that do not have direct access to public street frontage. They will be private roads that shall be maintained by the property owners who use them to access their property.

All access roads shall meet the following general standards:

1. Access roads shall be limited to six hundred feet (600') in length.
2. The width of the access tract/easement shall be a minimum of twenty five feet (25'). If the access is also acting as a joint utility easement or tract, the width must accommodate the public utility requirements.
3. Minimum pavement width for vehicle egress/ingress shall be twenty feet (20') and shall be identified as a fire lane with pavement markings or signage.
4. **Intentionally left blank.**
5. Minimum sidewalk or pavement path width provided for non-vehicular egress/ingress shall be five feet (5'). Width may be reduced to four feet (4') if no obstructions (signs, utility facilities, etc.) are within the sidewalk/path. Sidewalk or pavement path for non-vehicles shall be provided and separated from the vehicular egress/ingress with a curb. Private access roads serving a single residential unit are exempt from this requirement.
6. Driveway connections to the access tract shall be configured such that vehicles backing out of the driveways complete their maneuvers within the access tract without entering another property.
7. The connection of an access road to the public street shall be by a commercial driveway apron. The connection of individual lots to the access road shall be by either a residential or commercial driveway apron commensurate with the use of the property. **See Standard Detail T-31.**
8. Access roads shall be signed as private drives inclusive of all addresses being served off the access road.

9. Access roads exceeding one hundred and fifty feet (150') in length shall include a turnaround at the end of the road. The minimum size for the turnaround shall be the size required to provide the largest vehicle with an FHWA Vehicle Classification of 3 (without trailer) with a two-point turnaround via a hammerhead configuration or a cul-de-sac turnaround meeting the cul-de-sac design requirements specified in these design standards. The turnaround area must be paved and lie entirely within the access tract or easement.

In addition to the requirements listed above, access roads serving non-residential properties shall be twenty-four feet (24') for access roads servicing commercial properties and thirty feet (30') for access roads serving industrial properties.

10.01.7 Private Street

Community street requirements are usually best served by public streets, owned and maintained by the City. Private streets may be appropriate for some local accesses in very limited usage. Private streets shall provide a direct access to City streets and shall be limited to those streets accessing properties within a planned area or properties immediately adjacent. Private streets shall not be used by residents to travel from one public street to another. The design of a private street shall be such that it will discourage any through traffic of non-residents. A private street will not be allowed if it will result in land locking present or planned parcels.

Private streets shall be in conformance with the street standards that most closely reflects their intended use, with a minimum of thirty-four feet (34') of pavement width or twenty-eight feet (28') of pavement width with a marked fire lane on one side. Private street networks shall be configured to deter speeding. Traffic calming measures may also be required to deter speeding.

Private streets shall be located within permanently established tracts or easements. A capable, legally responsible owner or homeowners' association shall be established to maintain private streets. A plat or short plat with private streets requires an executed recorded Private Street Maintenance Agreement and a Storm Water Easement and Maintenance Agreement that obligate the future property owners to maintain the infrastructure indefinitely.

10.02 Street Geometry

For in-depth design information on the following criteria, please reference the AASHTO Manual "A Policy on Geometric Design of Highways & Streets," latest adopted edition.

10.02.1 Minimum Horizontal Curve Radius

Horizontal curves shall be designed to provide the minimum radii required for vehicles to safely negotiate a turn without leaving their driving lane and shall in no case violate minimum sight distance requirements. Minimum radii are established by the design speed of the street on which the curve is located and are listed in **Table 10-1**. On arterials and rustic collectors these radii may be reduced by superelevating the road cross-section.

10.02.2 Tangents Between Reverse Curves

Sections of straight roadway must be designed between curves to avoid quick left-right transitions that could potentially lead to loss of vehicular control. The length of these

straight sections should be a minimum of one hundred fifty feet (150') for arterials and collectors and one hundred feet (100') for local residential streets. Where reversing curves are superelevated, tangents between curves shall be of sufficient length to accommodate transitions into and out of the superelevated sections.

10.02.3 Superelevations

The process of superelevating a street provides a constant cross slope from one edge of the roadway to the other. This allows vehicles to travel around a turn at a higher speed than would be possible if the road were a normal crown cross section. Superelevations are allowed only on arterials and rustic collectors. The maximum superelevation rate allowed for these streets is eight percent (8%) and requires a design speed of thirty-five miles per hour (35 mph) or greater.

10.02.4 Vertical Grades

Vertical Grades, the amount of slope of a street in the direction of travel, is limited to a maximum of six percent (6%) for Arterials and eight percent (8%) for all other streets. All street sections shall maintain a minimum of one-half percent (0.5%) vertical grade. Vertical grades may be increased up to ten percent (10%) for non-arterials upon approval of the City Engineer. The City Engineer shall consider the public benefit of any deviation request including the classification of the roadway, traffic circulations, traffic congestion, emergency access, adjacent property access, length of grade, impact to public utilities, or any operational or safety factors. Deviations to the vertical street grade of a classified roadway shall generally not be granted unless it can be demonstrated that, and the City Engineer concurs that, the public benefits significantly outweigh any potential detriments. If approved, grades between eight percent (8%) and ten percent (10%) may trigger the additional following design considerations:

- Increased travel lane widths
- Enhanced Paving Section
- Incorporation of Separated Multi-use trail
- Incorporation of Median Islands
- Enhanced Intersection/Signal Improvements

10.02.5 Vertical Curves

Vertical curves are required where a change in vertical alignment equals or exceeds a one percent (1%) algebraic grade difference. Crest vertical curves shall be designed to provide the required minimum stopping sight distance for the streets design speed as listed in **Table 10-2 of Section 10-03**. Sag vertical curve lengths shall be designed to provide headlight sight distance equal to or greater than the design speed stopping sight distance. All vertical curves must be symmetrical, parabolic, and meet AASHTO standards. The following formula provides the information necessary to calculate minimum lengths for sag vertical curves.

A = algebraic grade difference, %;

$$L = 2S - \left(\frac{400 + 3.5S}{A} \right)$$

S = stopping sight distance, ft.;

L = length of sag vertical curve, ft.

10.02.6 Cross Slopes

City streets shall be crowned in the middle to provide drainage to the gutter line or roadside ditches. The cross slopes created by this crown shall be two percent (2%) for local streets and three percent (3%) for collectors, arterials, and roads with vertical grades of greater than six percent (6%). The cross slopes of roadways constructed with pervious/permeable pavement may be reduced to one percent (1%). Collectors and arterials shall have steeper cross slopes since the higher speeds associated with these roads require that water drain more quickly from the roadway to avoid hydroplaning.

10.02.7 Posted and Design Speed

For design purposes, the "Posted Speed" for any given street segment shall be as designated in **Table 10-1** or the existing signed speed limit, whichever is greater.

For design purposes, the "Design Speed" for any given street segment shall be ten miles per hour (10 mph) greater than the Posted Speed for arterials and five miles per hour (5 mph) greater than Posted Speed for non-arterials as designated in **Table 10-1**.

10.02.8 Right of Way

The required right-of-way will depend upon the width of the street and other improvements. Excluding cul-de-sacs, the typical requirement is for the right-of-way to extend a minimum of ten feet (10') behind the curb line on each side of the street. Additional right-of-way may be required for bike/pedestrian trails and/or storm facilities, for example. Right-of-way requirements may be variable within a street corridor due to intersections, turn lanes, bus loading zones, and other street features.

Right-of-way shall be conveyed to the City on a recorded plat or by a right-of-way dedication or separate instrument.

The minimum right-of-way requirements for the various street classifications are listed in **Table 10-1**.

10.02.9 Roadway Width (Travel Way)

The roadway width or travel way consists of inside through lanes and/or curb lanes, center turn lanes and/or bike lanes (where required), and curb and gutter. Special cases may also require acceleration and deceleration lanes and right and left turn pockets. Total roadway width is measured from the face of curb to the face of curb.

10.02.9.1 Inside Through Lanes and Curb Lanes

The street classification and the amount of existing and projected traffic will determine the number of lanes required for a street.

Curb lanes or outside lanes on all streets excluding residential collectors and local and rustic residential streets shall be a minimum of fourteen feet (14') wide. Streets will be

widened to include inside through lanes based on street classifications and/or projected traffic volumes. The minimum width for inside through lanes shall be eleven feet (11').

10.02.9.2 Center Turn Lanes

Center turn lanes will be required on principal and minor arterials. They may also be required on collectors depending upon the nature of the roadway and the number of left turn movement opportunities along the corridor. Center turn lanes shall be a minimum of eleven feet (11') wide.

10.02.9.3 Other Lanes

Acceleration and deceleration lanes may be required for sites located on arterials where heavy volumes and/or heavy truck movements into and out of the site would impact the speed and safety of the arterial.

Left turn and right turn pockets may be required at intersections with large numbers of left and/or right turns. Left turn pockets shall be a minimum of eleven feet (11') wide with right turn pockets a minimum of fourteen feet (14') wide.

10.02.9.4 Road Edge

All urban roads within the City of Auburn shall be designed using concrete curb and gutter per **WSDOT Standard Plan F-10.12, Traffic Curb & Gutter** at the roadway flowlines/flowpaths. Curbs that are not along flowlines/flowpaths may be constructed as cement concrete traffic curb per **WSDOT Standard Plan F-10.12, Traffic Curb & Gutter**. Rustic roads within the City may be designed with a gravel shoulder (minimum of 2½" Crushed Surfacing Top Coarse (CSTC) over eight inches (8") of "gravel base"; eight feet (8') wide for rustic collectors and three feet (3') wide for rustic residential) and a ditch for drainage. Rustic roads shall also meet AASHTO standards for a clear zone between the edge of pavement and any obstructions. Drainage inlets and grates along curbs shall be constructed per **WSDOT Standard Plan F-10.16**.

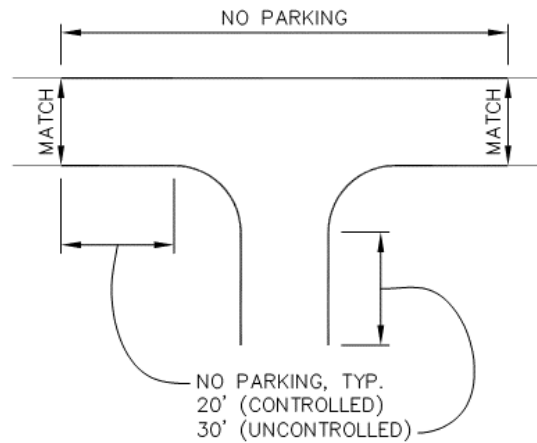
10.02.9.5 On-Street Parking

On-Street parking requirements shall be as designated in **Table 10-1**. For Local Residential streets where parking is allowed on one side only and there are landscape strips present on both sides of the road, the parking shall be placed on the side of the street that can accommodate the most parking. For Local Residential streets where parking is allowed on one side only and there is a landscape strip and/or bioretention swale on only one side of the roadway in accordance with **Figures 10-6A and/or 10-6B**, the parking shall be placed on the opposite side of the street from the landscape strip or bioretention swale.

Parking is not allowed at any of the following locations:

1. Within 20 feet of an uncontrolled intersection measured from the point of tangency on the entering curb radius.
2. Within 30 feet of a stop, yield or signal controlled intersection measured from the point of tangency on the entering curb radius.
3. Within any intersection. For "T" intersections, the no parking limits shall apply to both sides of the through street (top of the "T"). See **Figure 10-09 below**.

Figure 10-09 - T-Intersection Parking Restrictions



4. In front of or within 15 feet of each side of a fire hydrant.
5. In front of or within 5 feet of each side of a driveway.
6. Where mid-block crosswalks are installed, no parking shall be allowed on either side of the street within 50 feet in advance of the nearest edge of the crosswalk and within 20 feet past the furthest edge of the crosswalk. In no case shall the advance parking restriction for crosswalks be less than the minimum stopping sight distance of the roadway.

Additional parking restriction may be required depending upon roadway geometrics, adjacent land use, and the proximity to bridges and railroads.

10.02.9.6 Intersection Curb Radii

The minimum right-of-way requirements for the various curb radii shall be as designated in **Table 10-1**. At intersections with two different street classifications, the highest classification for curb radii shall be used except at intersections with residential streets where the lowest order street shall be used.

10.02.10 Street Layout

An efficient transportation system seeks to spread vehicle movements over a series of planned streets. The goal of the system is to encourage connectivity while preventing unacceptably high traffic volumes on any one street. Ample alternatives should exist to accommodate access for emergency vehicles. For these reasons the City will continue to plan a series of arterials and collectors designed to national standards to provide efficient service to the community. Ample alternatives should also exist to accommodate non-motorized transportation on arterials, collectors and local roads within and between subdivisions.

10.02.10.1 Local Residential Streets

The internal local residential street network for a subdivision should be designed to discourage regional through traffic and non-residential traffic from penetrating the subdivision or adjacent subdivisions. Local residential streets shall not exceed one

thousand three hundred feet (1,300') in length between intersections and shall not serve more than 100 dwelling units.

Residential subdivisions should be planned in a manner that minimizes the number of local street accesses to arterials and collectors. Residential subdivisions with greater than 100 lots shall have a minimum of two accesses to either an arterial or collector. Residential subdivisions developments with less than 100 lots shall have at least one access to an arterial or collector. Residential subdivisions with between 31 and 100 lots shall also provide a second emergency vehicle access route to an arterial or collector. Residential development shall provide for additional non-motorized access to adjacent developments and roadways when the residential subdivision exceeds 50 units to maintain connectivity.

10.02.10.2 Other Streets

New streets and/or new street systems, other than local residential streets serving residential subdivisions, shall be configured in conformance with the City's comprehensive plan guidelines and policies. Where the comprehensive plan lacks clear guidance to address a particular situation, the City may require traffic studies and other supporting analysis to help define the configuration and nature of the planned street system.

10.02.10.3 Cul-de-sacs

Where possible, streets shall be planned, designed and constructed to connect to future developments. All dead-end streets shall end in either a temporary or permanent cul-de-sac. Permanent dead-end streets or cul-de-sacs will only be allowed where a through street to connect adjacent properties and/or other streets is not needed or possible. Dead-end streets shall not be more than eight hundred feet (800') in length as measured from the center of the nearest intersection to the center of the cul-de-sac, unless the city determines that due to topography or existing development patterns there are no feasible alternatives and emergency services can be effectively provided. Dead end streets ending in permanent cul-de-sacs shall serve a maximum of 30 dwelling units. When applicable, non-motorized paths shall be provided at the end of the street to shorten walking distances to an adjacent arterial or public facilities including, but not limited to, schools or parks. Existing stub-end streets that are greater than eight hundred feet (800') in length shall be linked to other streets whenever the opportunity arises, unless it can be demonstrated that such connections would lead to a substantial rerouting of through traffic onto the street.

Dead-end streets longer than eight hundred feet (800') as measured from the center of the nearest intersection shall not be allowed to serve substantial new development.

10.2.10.3.1 Temporary Cul-de-sacs

Temporary cul-de-sacs may be provided only when there is a plan for extending the street.

Temporary cul-de-sacs shall have a paved surface with a diameter of sixty-five feet (65').

A sign shall be posted at the back of the temporary cul-de-sac stating that the road is planned to be extended in the future and to contact the City of Auburn Community Development & Public Works Department for further information.

10.2.10.3.2 Permanent Cul-de-Sacs

Permanent cul-de-sacs shall have a paved surface with a diameter of seventy-five feet (75') unless otherwise directed by the City.

Permanent cul-de-sacs right-of-way shall have diameter of ninety feet (90') unless otherwise directed by the City.

10.2.10.4 Traffic Volumes

Projected trip generation shall be calculated based on the current edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual.

Stub end streets shall not be linked to a new street if the connection is likely to result in traffic volumes that will exceed acceptable volumes for the road's classification. These volumes are defined in **Table 10-1** of these standards. Consideration may also be given to the character and nature of the neighborhoods proposed to be connected.

10.03 Sight Distance

Sight distance is defined as the length of roadway ahead that is visible to the driver. All roads, intersections, and access points should be designed to provide sight distance of sufficient length that drivers can control the operation of their vehicles to avoid striking an unexpected object in the traveled way.

The requirements for stopping sight distance and intersection sight distance listed in this section were taken from AASHTO's "A Policy on Geometric Design of Highways and Streets" manual as a quick reference guide and are for passenger cars on level roadways. Deviations from City design standards may require additional sight distance study and documentation. Sight distance design calculations will also be required for design grades not listed in the tables included herein.

10.03.1 Stopping Sight Distance

Stopping sight distance is the distance required at every point along a roadway for a vehicle traveling at or near the road's design speed to come to a stop before reaching a stationary object in its path. **Table 10-2** contains the minimum design values that shall be used for stopping sight distance.

In calculating stopping sight distance, the driver's eye is assumed to be three and a half feet (3.5') above the roadway and the height of the object to be seen by the driver is assumed to be two feet (2') above the roadway.

Table 10-2 Stopping Sight Distance

Design Speed (MPH)	Stopping Sight Distance (ft.)								
	Level Roads (Equation 10-1)	Downgrades* (Equation 10-2)				Upgrades* (Equation 10-2)			
		3%	6%	8%	10%	3%	6%	8%	10%
15	80	80	82	84	86	75	74	73	72
20	115	116	120	124	128	109	107	105	104
25	155	158	165	170	176	147	143	141	139
30	200	205	215	223	232	190	184	181	178
35	250	258	271	282	294	237	229	225	220
40	305	315	333	347	363	289	278	272	267
45	360	378	400	418	438	344	331	324	317
50	425	446	474	495	521	405	389	379	370
55	495	520	553	579	609	469	450	438	428
60	570	599	638	669	705	539	515	501	489
Equation 10-1: (Grades < 3%)					Equation 10-2 (Grades ≥ 3%)				
$d = 1.47Vt + 1.075 \frac{V^2}{a}$					$d = 1.47Vt + \frac{V^2}{30 \left(\left(\frac{a}{32.2} \right) \pm G \right)}$				
d = stopping sight distance, ft.					t = brake reaction time, 2.5s				
V = design speed, mph					G = percent grade divided by 100				
a = deceleration rate of 11.2ft/s ²									
Data for this table was taken from the 5 th edition of AASHTO's "A Policy on Geometric Design of Highways and Streets" manual, Exhibit 3-1 Stopping Sight Distance and Exhibit 3-2 Stopping Sight Distance on Grades.									
*Use Equation 10-2 above to calculate appropriate stopping sight distances for grades not shown.									

10.03.2 Intersection Sight Distance

Intersection sight distance is the clear sight distance necessary for a driver entering a controlled or uncontrolled intersection to proceed safely without impeding traffic. **Table 10-2A** contains the minimum design values that shall be used for intersection and driveway sight distance. The City Engineer may require the use of single unit of combination trucks as the design vehicle for minor road approaches with five percent (5%) or greater heavy vehicle volumes.

Table 10-2A Intersection Sight Distance

	Intersection Sight Distance, (ft.)		
	Uncontrolled Intersections* Use Figure 10-10	Two Way Stop Controlled Intersections** Use Figure 10-11 (Equation 10-3)	
Design Speed (mph)	Dimensions “a” and “b”	Dimension “a” for Left Turns (Table10-2C)	Dimension “a” for Right Turns (Table 10-2D)
15	70	170	145
20	90	225	195
25	115	280	240
30	140	335	290
35	165	390	335
40	195	445	385
45	220	500	430
50	245	555	480
55	285	610	530
60	325	665	575
Equation 10-3: $ISD = 1.47V_{major}t_g$		ISD = intersection sight distance (length of the leg of sight distance triangle along the major road) (ft.) V_{major} = design speed of major road (mph) t_g = time gap for minor road vehicle to enter the major road(s)	
Data for this table was taken from the 5 th edition of AASHTO’s “A Policy on Geometric Design of Highways and Streets” manual’s Exhibit 9-51 Length of Sight Triangle Leg-No Intersection Control, Exhibit 9-55 Design Intersection Sight Distance-Left Turn from Stop, and Exhibit 9-58 Design Intersection Sight Distance-Right Turn from Stop and Crossing Maneuver.			
* Where grade along an uncontrolled intersection approach exceeds 3%, the leg of the clear sight triangle along that approach should be adjusted by multiplying the sight distance listed in this table by the appropriate adjustment factor in Table 10-2B.			
** Intersection sight distance shown is for a stopped passenger car to turn onto a two-lane road with no median and grades of three percent (3%) or less. For other conditions, the time gap (t_g) will need to be adjusted per Tables 10-2C /10-2D and the sight distance recalculated.			
*** Refer to the latest edition of the AASHTO manual for sight distance requirements on major street left turns and at yield controlled intersections.			

Table 10-2B Uncontrolled Intersection Sight Distance Adjustment Factors

Approach Grade (%)	Adjustment Factors									
	Design Speed (mph)									
	15	20	25	30	35	40	45	50	55	60
-10	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
-8	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2
-6	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.2
-5	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
-4	1.0	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1
-3 to 3	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
4	1.0	1.0	1.0	1.0	1.0	0.9	0.9	0.9	0.9	0.9
5	1.0	1.0	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
6	1.0	1.0	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
8	1.0	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
10	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Note: Apply adjustment factor to sight distance measurement for each approach. Data for this table was taken from AASHTO Exhibit 9-53.										

Table 10-2C Time Gap for Left Turns

Design Vehicle	Time gap(t_g) (seconds) at design speed of major road
Passenger Car	7.5
Single Unit Truck	9.5
Combination Truck	11.5
<p>Note: Time gaps are for a stopped vehicle to turn left onto a two-lane roadway with no median and grades 3 percent or less. Table 10-2A values require adjustments as follows:</p> <p><i>For Multilane roads:</i></p> <p>For left turns onto two-way highways with more than two lanes add 0.5 seconds for passenger cars and 0.7 seconds for trucks for each additional lane, from the left, in excess of one, to be crossed by the turning vehicle.</p> <p><i>For minor road approach grades:</i></p> <p>If the approach grade is an upgrade that exceed 3 percent; add 0.2 seconds for each percent grade for left turns</p>	

Table 10-2D Time Gap for Right Turns

Design Vehicle	Time gap(t_g) (seconds) at design speed of major road
Passenger Car	6.5
Single Unit Truck	8.5
Combination Truck	10.5
<p>Note: Time gaps are for a stopped vehicle to turn right onto or cross a two-lane roadway with no median and grades 3 percent or less. Table 10-2A values require adjustments as follows:</p> <p><i>For Multilane roads:</i> For crossing a major road with more than two lanes add 0.5 seconds for passenger cars and 0.7 seconds for trucks for each additional lane to be crossed and for narrow medians that cannot store the design vehicle.</p> <p><i>For minor road approach grades:</i> If the approach grade is an upgrade that exceed 3 percent; add 0.1 seconds for each percent grade for left turns</p>	

10.03.3 Major Road and Minor Road

For the purposes of intersection sight distance analysis, the Minor Road shall be defined by any of the following criteria:

1. The controlled approaches of a Two-Way Stop Controlled Intersection.
2. The roadway with lower classification, lower design speed of lower traffic volumes.
3. For uncontrolled intersections of similar classification, design speed and volume roadways, the City Engineer shall designate the minor roadway.
4. Minor Roads include driveways, alleys, access tracts or any other location accessing a public road.

10.03.4 Sight Triangles

Intersection, driveway, and access point sight distances are analyzed using the applicable sight triangles per **Figures 10-10** and **10-11**. These sight triangles shall be provided on site plans including landscaping and other potential sight obstructions for all projects where intersections, driveways or access points are being installed or modified. Additionally, the City Engineer may require supporting documentation for vertical sight distance profile analysis on street grades over three percent (3%).

10.03.4.1 Measurements

Horizontal: Horizontal legs of the sight distance triangles on the major road are measured along the roadway centerline. Major road vertex points are placed at the midpoint of the traveled lane closest to the approach being analyzed. Minor

road vertex points are placed in accordance with following applicable sections for uncontrolled and controlled intersections.

Vertical: In calculating vertical sight distance at intersections the driver's eye is assumed to be three and a half feet (3.5') above the roadway surface and the object to be seen is three and a half feet (3.5') above the surface of the intersecting road.

10.03.4.2 Restrictions

The area within the sight distance triangle must be free from any sight-obscuring objects from between three feet (3') and eight feet (8') above the ground. Sight-obscuring objects include but are not limited to: buildings, parked vehicles, signs, fences, and landscaping.

10.03.4.3 Right-of-Way Requirements

The sight distance triangle shall be located completely within the City right-of-way. The City will require a right-of-way dedication as a condition of development approval to ensure the sight distance triangle is contained completely within the City right-of-way. If the City Engineer determines that this is not practical a "Sight Distance Easement" shall be required.

10.03.4.4 Uncontrolled Intersections

For uncontrolled intersections (intersections without signals, stop signs or yield signs) the sight distance triangle dimensions are determined by applying the applicable distances listed in **Table 10-2A** to the respective legs of the sight distance triangle as shown on **Figure 10-10**.

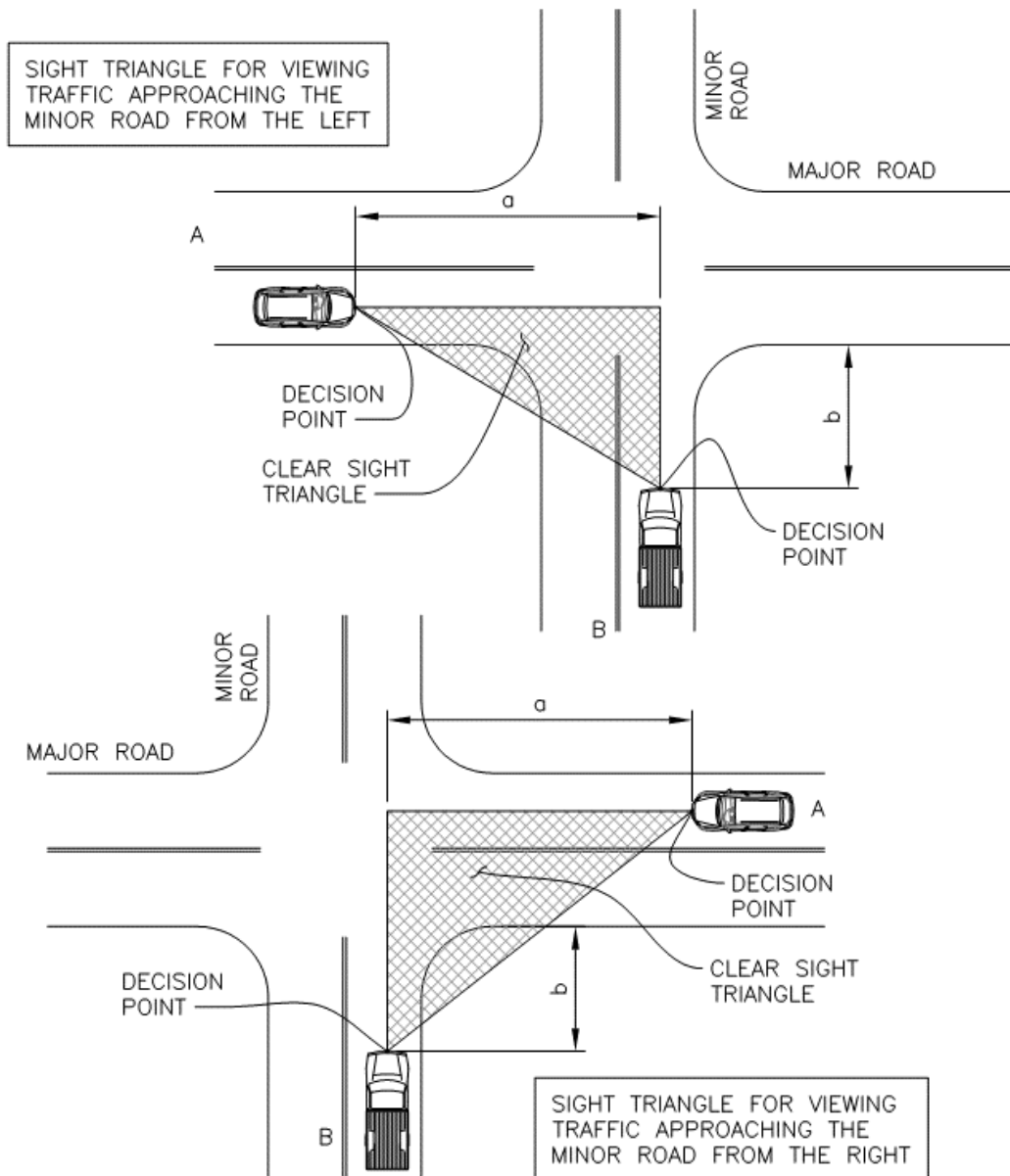
10.03.4.5 Two Way Stop Controlled Intersections

In calculating intersection and driveway sight distance for Two Way Stop Controlled intersections the vertex (decision point) of the sight triangle on the minor road shall be measured fourteen and a half feet (14.5') back from the nearest edge of the traveled roadway. Where parking is allowed on the major road this distance shall be measured from the far edge of the parking lane.

Left turns from the minor road: Using **Figure 10-11** sight triangles for traffic approaching from both the left and right should be provided using the value in **Table 10-2A** that corresponds to the major road design speed.

Right turns from the minor road: Using **Figure 10-11** a sight distance triangle for traffic approaching from the left should be provided using the value in **Table 10-2A** that corresponds to the major street design speed.

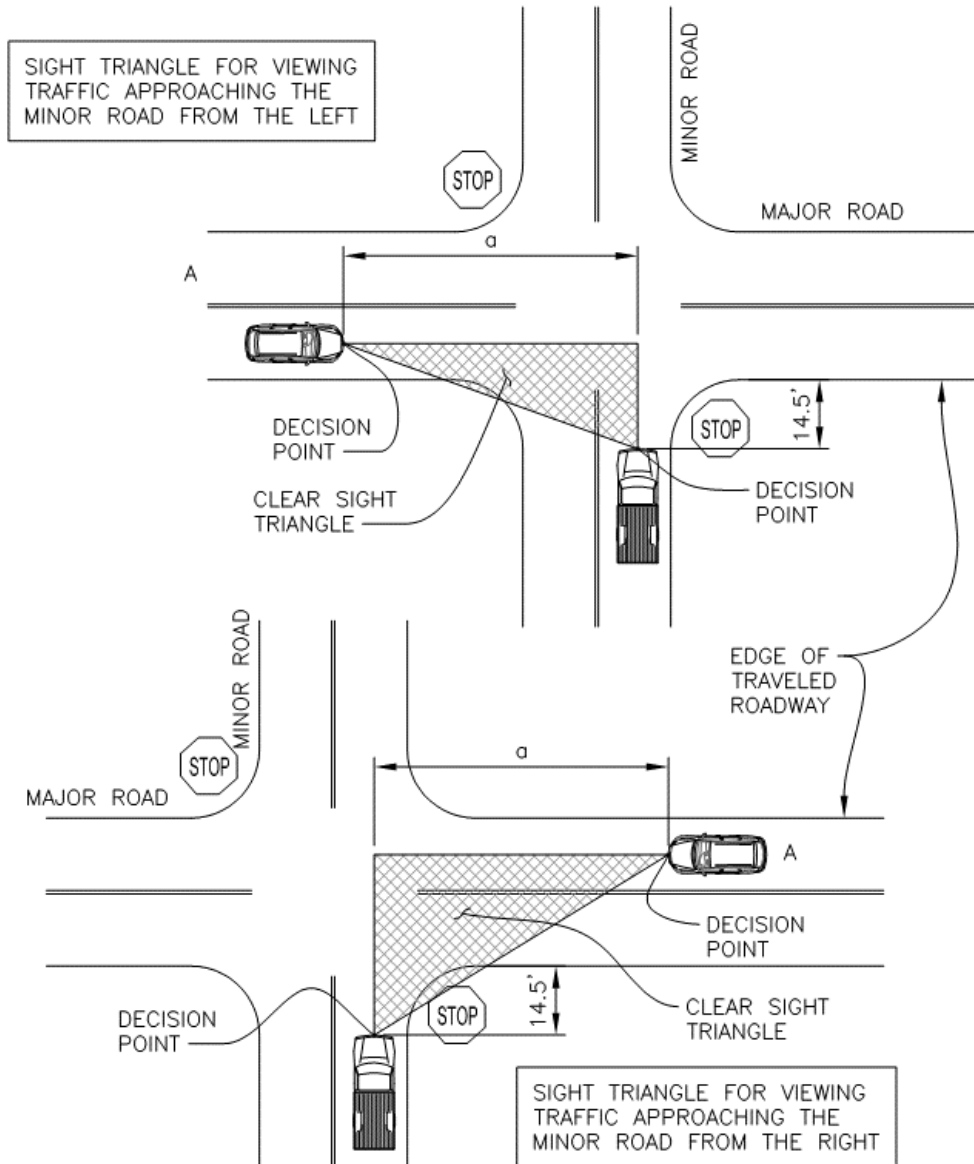
Figure 10-10 Intersection Sight Triangles for Uncontrolled Intersections



NOTES:

1. LEG "a" OF SIGHT TRIANGLE IS THE DISTANCE CORRESPONDING TO THE DESIGN SPEED OF ROAD "A" FROM THE UNCONTROLLED INTERSECTION COLUMN OF TABLE 10-2A.
2. LEG "b" OF SIGHT TRIANGLE IS THE DISTANCE CORRESPONDING TO THE DESIGN SPEED OF ROAD "B" FROM THE UNCONTROLLED INTERSECTION COLUMN OF TABLE 10-2A.
3. SIGHT TRIANGLE LEGS ARE MEASURED ALONG THE CENTERLINE OF EACH ROADWAY.
4. DECISION POINTS ARE PLACED AT THE CENTERLINE OF THE TRAVELED LANE BEING ANALYZED.

Figure 10-11 Intersection Sight Triangles for Two-Way Stop Controlled Intersections



NOTES:

1. LEG "a" OF SIGHT TRIANGLE IS THE DISTANCE CORRESPONDING TO THE DESIGN SPEED OF ROAD "A" FROM THE TWO-WAY STOP CONTROLLED INTERSECTION COLUMN OF TABLE 10-2A.
2. WHERE PARKING IS ALLOWED ON THE MAJOR STREET, SIGHT DISTANCE IS MEASURED FROM A POINT 14.5' BACK FROM THE FAR EDGE OF THE PARKING LANE TO THE CENTER OF THE LANE BEING ANALYZED.
3. SIGHT TRIANGLE LEGS ARE MEASURED ALONG THE CENTERLINE OF EACH ROADWAY.
4. DECISION POINTS ARE PLACED AT THE CENTERLINE OF THE TRAVELED LANE BEING ANALYZED.

10.03.4.6 All Way Stop Controlled Intersections

At All Way Stop Controlled intersections, the first stopped vehicle on one approach should be visible to the drivers of the first stopped vehicles on each of the other approaches.

10.03.4.7 Signalized Intersections

At signalized intersections the first stopped vehicle on one approach should be visible to the drivers of the first stopped vehicles on each of the other approaches. Left-turning vehicles should have sufficient sight distance to complete left turns. Additionally, if right turns on a red signal are permitted from any approach then the appropriate sight triangle should be provided to accommodate right turns on that approach.

10.03.2 Decision Sight Distance

Decision sight distance is used in cases where the driver is required to detect unexpected or confusing situations and then make appropriate changes in their driving style or method. This could mean changing lanes, slowing down, or coming to a complete stop. Decision sight distance will need to be addressed when designing roads with tight turns and unexpected driveway and street connections. When decision sight distance requirements are applicable, the guidelines presented in the latest edition of AASHTO shall be used.

10.03.3 Passing Sight Distance

Passing sight distance should be addressed when designing two (2) lane roads where vehicle speeds can differ by a considerable amount depending on the driver. When passing sight distance requirements are applicable, the guidelines presented in the latest edition of AASHTO shall be used.

10.04 Street Access Points

All access points to and from City streets, including intersections and driveways, shall be approved by the City prior to construction. These access points shall meet all the requirements contained throughout this chapter for sight distance, spacing, and other safety considerations.

The following section contains design criteria on all access points including street intersections and driveways. These criteria are minimum values and may need to be modified according to safety factors, traffic volumes (existing and/or projected), topography, design speed, design vehicle requirements, drainage, and other conditions, both existing and projected.

10.04.1 Public Street Intersections

Public Street Intersections are intersections where two (2) or more City streets intersect. These intersections shall be designed using the following criteria:

10.04.1.1 Intersection Spacing

Public street intersections shall meet the minimum centerline spacing requirements as shown in **Table 10-3 below**.

Table 10-3 Minimum Intersection Spacing from Centerline to Centerline

Minimum Intersection Spacing from Centerline to Centerline (ft.)					
PRINCIPAL ARTERIAL	MINOR ARTERIAL	RESIDENTIAL & NON-RESIDENTIAL COLLECTORS	RUSTIC COLLECTOR	LOCAL STREETS	
500 ¹	500 ¹	250	250	125	LOCAL STREETS
1320	1320	500	500	250	RUSTIC COLLECTOR
2640	1320	500	500	250	RESIDENTIAL & NON-RESIDENTIAL COLLECTORS
2640	2640	1320	1320	500 ¹	MINOR ARTERIAL
2640	2640	2640	1320	500 ¹	PRINCIPAL ARTERIAL
Notes: 1. Local streets shall generally not be allowed to access directly onto arterials. 2. Refer to section 10.03 for intersection sight distance requirements. 3. Refer to section 10.05 for intersection pedestrian accessibility requirements.					

10.04.1.2 Horizontal Approach Angle

The horizontal approach angle of public street intersections shall be between 85° and 95° at the centerlines of intersecting streets.

10.04.1.3 Intersection Approach Offsets

Public Street intersections shall be aligned so that opposing single left turn lanes and through lanes are not offset more than four feet (4') as measured from the lane centerline approach tangent.

10.04.1.4 Curb and Right-of-Way Radius

A minimum curb radius is required at intersection corners for vehicles to safely execute a right turn at a reasonable rate of speed without crossing lanes or encroaching onto the adjacent curb. At intersections of differing street classification, the higher classification street curb radius requirements shall be used. The exception to this rule is for local residential streets where the minimum radii listed in **Table 10-1** shall be used. The right-of-way radius is the additional radius required to install sidewalks, landscape strips, and other roadway appurtenances. Additional right-of-way may be required near intersections to accommodate auxiliary traffic lanes and equipment for existing or future traffic signals and street lights. These minimum values and listed in **Table 10-1**.

10.04.1.5 Landing Approach

The landing approach is a defined segment of the street before the intersection and is measured back from the point of tangency of the curb radius on each approach to the intersection. The requirements for minimum landing approach length and maximum landing approach grade are listed in **Table 10-1 Street Crowns**.

Public street intersections shall be designed to drain away from the higher classification street. Grades shall match at the center of intersections for equal classification streets. At intersections of differing classification streets, the crown shall be carried through the intersection for the higher classification.

10.04.2 Private Street Intersections

Private street intersections are those intersections where a private street intersects a City street. These intersections shall be designed in the same manner as public street intersections, except that the private streets will be stop-controlled.

10.04.3 Driveways

Driveways shall be sized and spaced per Standard Detail T-04 and as specified herein.

Driveways shall be constructed per WSDOT Standard Plan F-80.10, as modified herein. Note that industrial and commercial driveways require integral curb and reinforcing as specified in Section 8-06 of the Construction Standards Part 1 – Special Provisions.

Driveways can be broken into the following classifications:

- A. Residential Driveways – Driveways to single family residences.
- B. Commercial/Industrial Driveways – Driveways to all properties except single family residential.
- C. Temporary Driveways – Driveways to property allowed prior to and during construction only.
- D. Emergency Driveways – Driveways required by the fire department to provide an alternative emergency-only access to the property.
- E. Signalized Driveways – For special circumstances when no other option is available, the City may allow signalized access to a public street from a private access. In such situations, dedication to the City of any right-of-way necessary for maintaining and operating the intersection will be required. Additional mitigation measures may be required to ensure safe and efficient access to the public street. The private leg of the intersection within the right-of-way shall be designed to the applicable public street standard as determined by the City.

10.04.3.1 Driveway Locations

Properties/parcels, or a development project that incorporates multiple adjacent parcels, shall be limited to one driveway access to a City street (or alley). Multiple driveway accesses to a street (or alley) shall only be allowed when the City determines that the additional access does not create a safety concern, impede traffic flow, or is required.

To address safety or to mitigate impacts of traffic flow, the City may require two or more contiguous non-single family properties to share a single driveway, and/or require the driveway to be located on the lowest classification of street (or alley) when a property has frontage on two or more streets (or alleys).

Driveway accesses within the “Functional Intersection Boundary” shall be either prohibited or restricted in conformance with **Section 10.04.4.1.1** below. The City may also impose driveway restrictions at other locations when a safety hazard is identified or to mitigate impacts of traffic flow along a classified street. Such restrictions shall be incorporated into the design of the driveway in conformance with the provisions of **Section 10.04.4.5** in a manner that strives to maintain existing access turning movements to other properties in the vicinity.

Redeveloped properties are not guaranteed that their existing driveways will be retained. Redeveloped properties that meet the requirements for half street improvements, have more than one access point, or do not meet current City standards may be required to eliminate, relocate or modify existing driveway access/accesses.

Except for Local Residential Streets the spacing of driveways and their separation from intersections shall meet the minimum “Functional Intersection Boundary” distances of this Chapter.

10.04.3.1.1 Functional Intersection Boundary

See Table 10-4 and Figure 10-12.

The functional intersection boundary is the portion of the street leading up to the intersection required to allow vehicle movements and storage. This is the area within which drivers identify the situation, change lanes, come to a stop, and wait before proceeding through the intersection. Driveways shall be either prohibited or restricted within the functional intersection boundary in accordance with **Table 10-4** and **Figure 10-13**. The functional length of an intersection is measured from the point of curvature/point of tangency (PC/PT) of the curb return. Driveway restrictions include prohibiting either all left turn movements, left turns out of, or left turns into the subject driveway.

Table 10-4 Distance Requirements for Functional Intersection Boundaries

Posted Speed mph	Speed ft./sec	Reaction Time (sec)	Decision Distance (ft.) "d ₁ "	Lane Change Distance (ft.) "d ₂ "	Braking Distance (ft.) "d ₃ "	Storage Length (ft.) "d ₄ "
25 mph	37	1	37	25	60	50
30 mph	44	1	44	40	86	50
35 mph	51	1	51	60	118	100
40 mph	59	1	59	85	154	100
45 mph	66	1	66	105	194	100
50 mph	73	1	73	140	240	100

Figure 10-12 Functional Length Diagram of an Intersection with Right and/or Left-Turn Lane

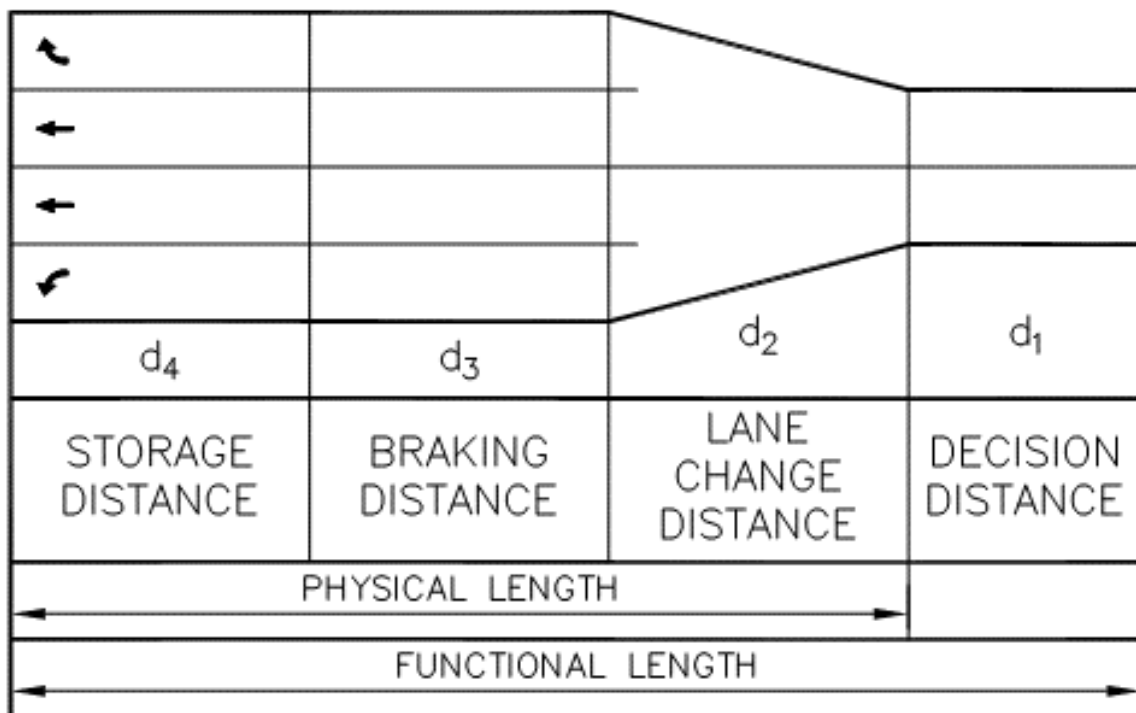
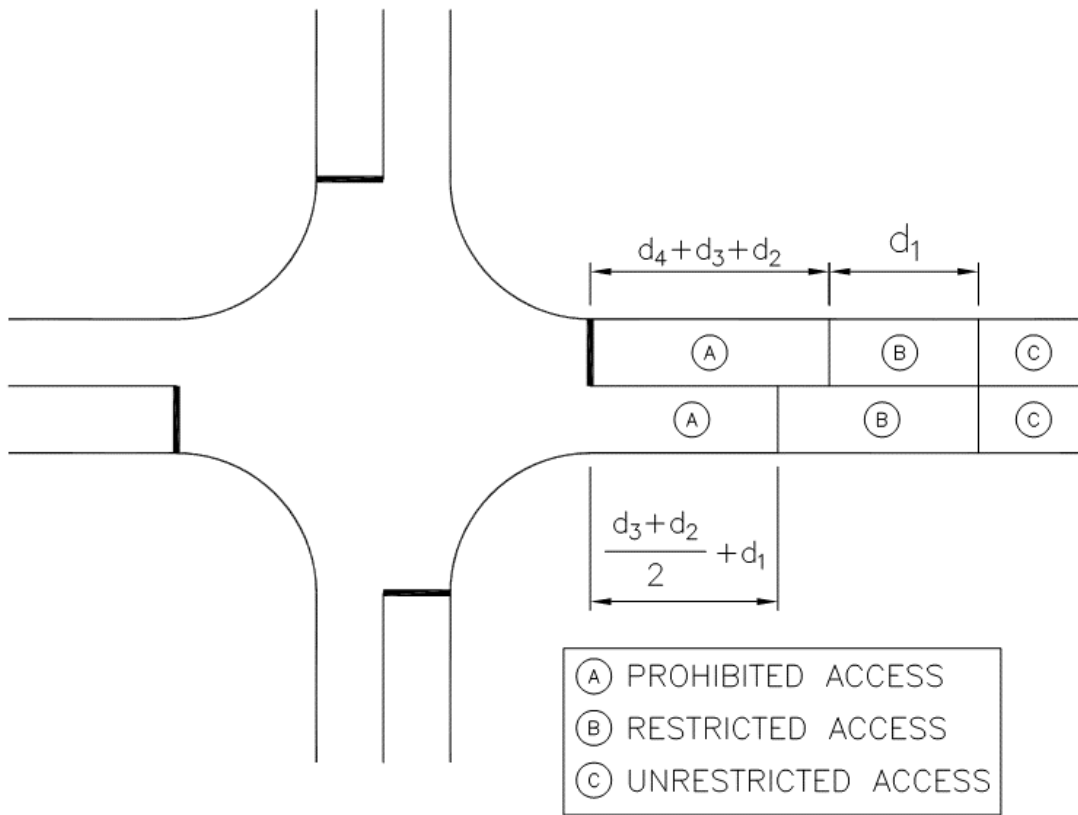


Figure 10-13 Functional Intersection Boundary Restricted Access Diagram



10.4.3.2 Driveway Lay Out

See Standard Detail T-04.

Driveways shall be designed in such a manner as to allow for efficient and safe ingress and egress from the City streets. Driveways and on-site parking, other than that for single-family residences on unclassified roads or alleys, shall be designed such that vehicle-backing maneuvers will not occur onto the street. A properly designed driveway shall allow the largest typical vehicle that will use the driveway (i.e. tractor-trailers at large warehouses, delivery trucks at mini marts) to enter and exit the site without encroaching into opposing traffic.

Driveways for adjacent properties should be separated by a minimum of ten feet (10') for residential and fifty feet (50') for commercial/industrial. This distance should be measured from the outside edge of the driveway apron. When this separation is not obtainable, a single driveway centered on the property line may be required.

When designing site layout and driveway access, internal circulation shall be such that on-site traffic will not backup the driveway impeding vehicles in the public street. The City may require sites with internal traffic congestion to design driveways with long throat lengths to provide extra storage to avoid impacting City streets.

10.4.3.3 Driveway Alignment (Horizontal and Vertical)

The angle of driveway throats to the City streets shall not be less than eighty-five degrees (85°) unless a "pork chop" or other access control device is allowed to be utilized per **Section 10.15**.

The vertical grade behind the driveway shall not exceed five percent (5%) for a distance of twelve feet (12') beyond back of sidewalk or right of way line. Driveways shall be designed to preclude vehicles from dragging when entering or exiting the site. Driveways shall meet all sight distance requirements per **Section 10.03**.

10.04.4. Driveway Widths

10.04.4.4.1 Residential

Residential driveways shall be used when serving one single family residence or duplex (not connected via an access tract, which requires a commercial driveway). Driveway widths shall be a minimum of eleven feet (11') and a maximum of eighteen feet (18'). Residential driveways shall be constructed using a minimum thickness of six inches (6") of non-reinforced concrete.

10.04.4.4.2 Commercial/Industrial

Commercial and industrial driveway widths shall be based on the number of lanes used on the driveway and the type of use. Commercial driveways shall be constructed using a minimum thickness of eight inches (8") of reinforced concrete. The three categories described below will be determined based on the vehicles expected to use the site.

- A. Light commercial/industrial driveways should be used for sites where the average vehicle use will range from passenger vehicles to small size delivery trucks. Examples include mini marts, strip malls, fast-food restaurants, triplexes, and small apartment buildings. Driveways

will have one entering lane and up to two exiting lanes with the lane widths restricted to a maximum of twelve feet (12').

- B. Medium commercial/industrial driveways should be used for sites where the average vehicle use will range from medium to high volumes of passenger vehicles to multiple medium delivery trucks per day and the occasional large tractor/trailer delivery truck. Examples included supermarkets, large outlet stores, shopping malls, large apartment buildings, and busy retail stores located on arterials. Driveways will have one entering lane and up to two exiting lanes with the lane widths restricted to a maximum of fourteen feet (14').
- C. Heavy commercial/industrial driveways should be used for sites where high volumes of medium to large tractor/trailer trucks enter and exit every day. Examples include manufacturing and storage warehouses. Driveways will have one entering lane and one exiting lane with the lane widths restricted to a maximum of sixteen feet (16').

Driveway uses discussed above may be subject to change based on the street classification on which they are located. For example: a site use that may normally fall under the light commercial/industrial classification may be upgraded to a medium commercial/industrial classification if it is located on a principal or minor arterial to facilitate moving vehicles off the right-of-way in a more efficient manner.

10.04.5 Restricted Access Driveways

Restricted Access Driveways are used to restrict turning movements out of or into driveways. Turning restrictions at driveway locations shall be by one or more of the following methods as deemed appropriate by the City.

- A. Median Islands (Per Section 10.15.1)
- B. Traffic ("C") Curbs (Per Section 10.15.2)
- C. Pork Chops (Per Section 10.15.3)
- D. Signing (Per Section 10.15.4)
- E. Pavement Markings (Per Section 10.15.5)

10.05 Sidewalks

Sidewalk requirements vary by street classification and corridor/area specific standards as determined by the City. Sidewalks are required along both sides of all street classifications except for rustic streets.

See Standard Details T-13 & T-15. Pervious sidewalks (where authorized for use by the City Engineer) shall be per **Standard Detail T-14.**

10.05.1 Sidewalk Widths

Sidewalks shall be a minimum of five feet (5') in width for all local residential and residential collector streets. Sidewalks shall be a minimum of ten feet (10') in width for all principal arterials, minor arterials, non-residential collectors, and local non-residential streets. Non-standard widths of sidewalk greater than the standards identified above may be required to maintain continuity on existing corridors. All sidewalks shall have a minimum of five feet (5ft) of unobstructed width.

10.05.1.1 Downtown Auburn

Sidewalk widths in the Downtown Urban Center Zone shall be a minimum of ten feet (10') in width as measured from face of curb to face of building or Right-of-way. All sidewalks in the downtown zone shall maintain a minimum walking zone of five feet (5') in width, free of all obstructions including utilities, signage, street trees, furniture or other elements, permanent or temporary.

10.05.1.2 Structural Section

Sidewalks shall be a minimum of four inches (4") thick concrete over two inches (2") of Crushed Surface Top Course (CSTC). At driveway crossings the sidewalk section shall match that required for the driveway. When sidewalks are installed at the back of the curb, a thickened edge shall be provided as shown in **Standard Details T-13.0 & T-14.0**.

10.05.2 Meandering Sidewalks

The City Engineer may approve meandering sidewalks along a corridor when the sidewalk, landscaping, lighting, signing, right-of-way, and other surface features are integrated into the design of the improvements. Additional right-of-way (or an easement) may be required to accommodate the meander of the sidewalk and other surface features.

10.05.3 Accessibility

All sidewalk cross slopes shall not exceed two percent (2%). Sidewalk grade shall not exceed the grade of the adjacent street centerline.

10.05.3.1 Curb Ramps

See WSDOT Standard Plans F-40.12, F-40.15 & F-40.16.

Curb ramps shall be provided at all intersections and pedestrian crossings having vertical curb sections. Every curb ramp shall have at least one receiving ramp. In special conditions, curb ramps shall also be provided to enable passage across curbed radius return access points. All curb ramps shall have detectable warning patterns formed with manufactured truncated domes in accordance with **WSDOT Standard Plan F-45.10**. Truncated dome color shall be yellow except in the downtown urban core area where truncated dome color shall be brick red. Pervious cement concrete ramps and landings shall not be allowed.

For any deficient element that does not meet ADA requirements, designers shall document the deficiency via a Maximum Extent Feasible (MEF) document stamped and signed by a professional engineer licensed in the State of Washington. The MEF document will be reviewed for acceptance by the City.

10.06 Bikeways

The City of Auburn bikeway standards are designed to ensure that bikeways are constructed in a manner that provides a safe and convenient network of interconnected routes for bicycling.

Bikeways are any road, street path or way which in some manner is specifically designated for the exclusive use of bicycles or are to be shared with other transportation modes. Bikeway

facilities shall be incorporated into development and transportation projects in accordance with the Future Trail and Bicycle Network plan adopted by the City of Auburn Comprehensive Transportation Plan.

Bikeways shall be designed in accordance with AASHTO's "Guide for the Development of Bicycle Facilities 1999," the latest adopted edition of FHWA's Manual on Uniform Traffic Control Devices (MUTCD), this section, and applicable City of Auburn standard details.

10.06.1 Bikeway Classifications

The City of Auburn's Future Trail and Bicycle Network consists of various classification bikeways. Typically, these bikeways are shared with other transportation modes, although they may be provided exclusively for bicycle use. Bikeways are categorized as follows:

10.06.1.1 Class I Bikeway

Class I Bikeways are facilities shared with other non-motorized modes and are physically separated from motorized vehicle roadways. For the purposes of this section, Class I Bikeway design standards are for bicycle facilities that generally parallel a roadway with minimal crossflow by motor vehicles. It is designed and built primarily for use by bicycles, but may also be used by pedestrians, joggers, skaters, wheelchair users (both non-motorized and motorized), equestrians, and other non-motorized users. When required, Class I Bikeways shall be designed for two-way traffic and meet the following minimum design criteria:

10.06.1.1.1 Width

Standard Class I Bikeways shall include a fourteen foot (14') paved section in accordance with **Section 10.06.1.1.2**. Minimum ten foot (10') paved width.

10.06.1.1.2 Structural Section

Minimum pavement section of six inches (6") of Crushed Surfacing Base Course (CSBC), two inches (2") of Crushed Surfacing Top Course (CSTC), and two inches (2") of Class 1/2" asphalt concrete pavement. When the California Bearing Ratio (CBR) of the existing soil is less than five (5), an additional six inches (6") of gravel base shall be required. When the trail is also utilized as a service road, the Class 1/2" asphalt concrete pavement section shall be increased to three inches (3").

10.06.1.1.3 Geometrics

Class I Bikeways shall closely conform to the grades of the adjacent street and meet the geometric design standards of AASHTO's "Guide for the Development of Bicycle Facilities 1999".

10.06.1.1.4 Buffer

Class I Bikeways shall have a minimum five foot (5') landscape buffer located between the bikeway and any adjacent street.

10.06.1.1.5 Driveway Crossings

Where Class I Bikeways are intersected by driveways appropriate signing and pavement markings shall be provided consistent with MUTCD requirements for midblock crossings.

10.06.1.1.6 Ownership

Class I Bikeways that are part of the City's Future Trails and Bicycle Network shall be public and shall be located within the public right-of-way, tracts or easements.

10.06.1.2 Class II Bikeway

Class II Bikeways, or "Bike Lanes," are incorporated within the street right-of-way. Bike lanes are established on streets in corridors where there is a current of anticipated bicycle demand and where it would be unsafe for bicyclists to ride in travel lanes. Bike lanes shall be provided in accordance with the Future Trail and Bicycle Network plan pursuant to the City of Auburn Comprehensive Transportation Plan. Bike lanes are exclusive one-way bicycle facilities delineated by pavement markings and signing. Bicycle traffic is carried in the same direction as the adjacent motorized vehicle traffic. When required, bike lanes shall meet the following minimum design criteria:

10.06.1.2.1 Width

Minimum six foot (6') paved width as measured from nearest edge of the travel way to face of curb, edge of pavement, or edge of parking lane.

10.06.1.2.2 Structural Section

Bike lanes shall have the same pavement cross-section as the adjacent street.

10.06.1.2.3 Geometrics

Class II Bikeways, as part of the street section, shall follow the same geometric design standards.

10.06.1.3 Class III Bikeway

Class III Bikeways, or "Shared Lane," are facilities shared by bicyclists and motorized vehicles. Class III Bikeways will be utilized, in accordance with the Future Trail and Bicycle Network plan, on existing streets as interim bike corridors until a Class I or Class II facility can be provided. Class III Bikeways may or may not be delineated with shared use pavement markings and signage. Generally, lower-speed/lower-volume streets are adequate for bicycle travel, so additional signing and pavement markings for bicycle use are unnecessary. When required, Class III Bikeways shall meet the following minimum design criteria.

10.06.1.3.1 Width

Minimum fourteen foot (14') paved width as measured from lane line to face of curb, edge of pavement, or edge of parking lane.

10.06.1.3.2 Structural Section

Class III Bikeways shall have the same pavement cross-section as the adjacent street.

10.06.1.3.3 Geometrics

Class III Bikeways, as part of the street section, shall follow the same geometric design standards.

10.06.1.4 Class IV Bikeway

Class IV Bikeways consist of all improved roadways unless otherwise designated as Class I, Class II, or Class III Bikeways.

10.06.2 Bikeways at Railroad Crossings

Railroad-Bikeway grade crossings shall be designed as near perpendicular as possible. If rail crossing is less than forty-five degrees (45°), an additional paved shoulder of sufficient width shall be provided to permit the bicyclist to cross the track at a safer angle. Where this is not possible and train speeds are low, compressible flangeway fillers will be required. When not under City control the railroad owner shall be responsible for bicycle crossings.

10.06.3 Bikeways at Roundabouts

Class I Bikeways at roundabouts shall be combined with the adjacent sidewalk, if applicable; to create a single shared use crossing through the roundabout zone.

Class II and Class III Bikeways shall be terminated a minimum of sixty-five feet (65') in advance of roundabouts using appropriate signing and striping with transitions to the adjacent pedestrian facilities which shall be enhanced through the roundabout zone, consistent with a Class I Bikeway, to accommodate the shared use with bicycles.

10.06.4 Bikeways at Signalized Intersections

Class I Bikeway crossings at signalized intersections shall be combined with the adjacent sidewalk, if applicable, to create a single shared facility utilizing the protected pedestrian crossing at traffic signals.

Class II and Class III Bikeways shall be provided an optional transition to the adjacent pedestrian facilities a minimum of fifty feet (50') in advance of traffic signals using appropriate signing and striping. The adjacent pedestrian facility shall be enhanced to Class I Bikeway standards in advance of the transition point to accommodate the shared use through the intersection.

10.06.5 Bikeways at Unsignalized Intersections

Class I Bikeway crossings at unsignalized intersections shall be combined with the adjacent sidewalk, if applicable, to create a single shared use crossing. Class II Bikeways shall be delineated in accordance with City of Auburn standard details and MUTCD bike lane requirements for intersections.

10.06.6 Bikeway Pavement Markings, Signing, and Striping

See Standard Detail T-17 and WSDOT Standard Plan M-9.50

Pavement markings, signing, and striping for bikeways shall be designed in accordance with City of Auburn standard details and Manual of Uniform Traffic Control Devices (MUTCD) requirements.

10.07 Pavement Design

This section of the Standards has been prepared for engineers to use in the design of pavement sections for City streets. The use of the following information will ensure that paved transportation corridors are adequately built or improved in a uniform and consistent manner. Except where indicated otherwise herein, all references to pavement refer to standard pavement sections and not to permeable pavement.

The information contained in **Table 10-5** has been established to minimize the structural failures in streets, due to traffic loadings and/or existing soils conditions. Engineers will be allowed to do their own pavement designs in accordance with the current AASHTO design procedure and the minimum City requirements supplied in **Section 10.07.3**. All pavement designs must be completed and stamped by a Professional Engineer licensed in Washington State, and all calculations must be submitted to the City in the Geotechnical Report.

The pavement design information contained herein was established for a complete range of street and traffic conditions excluding principal arterials. It has been simplified so that extensive data and computer analysis is not necessary for developing pavement designs for most projects. A separate design study will be required for principal arterials and streets where the daily average traffic count is expected to exceed 15,000 vehicles per day and streets where unusually heavy truck and bus traffic is expected or encountered, such as freight routes and bus routes.

Freight routes are defined in the "City of Auburn Comprehensive Transportation Plan". Studies should be performed along the freight route to determine the vehicle mix and volumes. Pavement sections for freight routes are not defined in the following tables and need to be designed to accommodate anticipated volumes.

10.07.1 Design Requirements

10.07.1.1 Street Classification

The classification of a particular street, (i.e. Residential Collector), can be obtained from the City of Auburn. The classification of a street will be required to determine the volume and mix of vehicles for which it is designed.

In some cases, where a street has yet to be designated a specific classification, street pavement should be designed based on the anticipated traffic volume. An anticipated daily traffic count can be obtained from the City of Auburn for the street in question or a similar street that functions in the same manner. The City may, however, require the applicant to obtain additional traffic information, as warranted.

10.07.1.2 Street Subgrade

For the purpose of pavement design, the California Bearing Ratio (hereafter referred to as CBR) will be used to classify the type of existing subgrade soils. CBR's are used

because most independent testing laboratories and geotechnical firms have the ability to provide CBR data. The scope of this section does not cover existing subgrade with a CBR less than “3”. When the CBR is less than “3”, a Geotechnical Design is required.

The subgrade under the proposed street shall have its CBR evaluated by an independent testing laboratory or geotechnical firm. The existing subgrade shall then be classified as determined in the soils classification section (**Section 10.07.3**). The proposed roadway shall have a minimum of one CBR test for every 1,000 feet of road and/or for every obvious change in subgrade material (minimum of two (2) tests per street).

Prior to placing any street base material, the subgrade shall be rolled and compacted to a minimum of 95% of the maximum density as determined by ASTM D-1557 (Modified Proctor).

Any sections of a roadway that exhibit “pumping” shall be removed to a depth where the pumping ceases and replaced with granular imported material that can be compacted to the required 95% of the maximum density as determined by ASTM-1557 without pumping, or as directed by a Geotechnical Engineer licensed in the State of Washington.

If the existing subgrade is classified as a poor subgrade, then a geotextile fabric may be required on the subgrade prior to placing any subbase or base materials. The geotextile fabric shall be a woven, permeable fabric produced for placement in road bases.

Other requirements for subgrade grading, including slopes and retaining wall, are covered in Chapter 5.

10.07.1.3 Street Pavement Sections

Street pavement section requirements can be determined by using the pavement design chart in **Section 10.07.2**. The CBR obtained from the testing or geotechnical firm, the type and class of road from the City of Auburn, will assist in determining the appropriate chart column.

A civil engineer licensed in the State of Washington may also design street pavement sections. However, the minimum allowable thickness of asphalt will be a two inch (2”) leveling course with a two inch (2”) overlay of class 1/2-inch asphalt. The maximum allowable thickness for a single lift of asphalt shall be two inches (2”) for the wearing course, and four inches (4”) for base courses. **Section 10.07.3** provides additional information on pavement design requirements.

10.07.2 Pavement Section Design Chart

The following chart contains the minimum allowed pavement design based on traffic volumes and CBR’s unless otherwise designed by a licensed civil engineer. Due to high traffic volumes and/or the large amount of truck and bus trips, Principal Arterials, bus routes, and/or freight routes, as designated by the City, are not included and shall be designed using the AASHTO pavement design approach. The minimum pavement section shall be as determined by the pavement design using the AASHTO pavement design approach with a 20-year service life or the Minor Arterial/Medium Soils from the table below, whichever is a thicker/stronger section.

Table 10-5 Pavement Section Design Chart

	Poor Soils (CBR 3-5)	Medium Soils (CBR 6-10)	Good Soils (CBR 11-20)	Excellent Soils (CBR >20)
Private Streets Alleys Access Roads Rustic Residential	2" CL 1/2" 4" CL 1" 11.5" CSBC Geotextile Fabric	2" CL 1/2" 4" CL 1" 7.5" CSBC	2" CL 1/2" 4" CL 1" 4" CSBC	2" CL 1/2" 3" CL 1" 4" CSBC
Local Streets	2" CL 1/2" 4" CL 1" 11.5" CSBC Geotextile Fabric	2" CL 1/2" 4" CL 1" 7.5" CSBC	2" CL 1/2" 4" CL 1" 4" CSBC	2" CL 1/2" 3" CL 1" 4" CSBC
Residential Collectors Rustic Collectors	3" CL 1/2" 4" CL 1" 14.5" CSBC Geotextile Fabric	3" CL 1/2" 4" CL 1" 9" CSBC	3" CL 1/2" 4" CL 1" 5.5" CSBC	3" CL 1/2" 3.5" CL 1" 4" CSBC
Non-Residential Collectors	3" CL 1/2" 4" CL 1" 14.5" CSBC Geotextile Fabric	3" CL 1/2" 4" CL 1" 9" CSBC	3" CL 1/2" 4" CL 1" 5.5" CSBC	3" CL 1/2" 3.5" CL 1" 4" CSBC
Minor Arterials	2" CL 1/2" 6 CL 1" 18.5" CSBC Geotextile Fabric	2" CL 1/2" 6" CL 1" 11" CSBC	3" CL 1/2" 4" CL 1" 9.5" CSBC	3" CL 1/2" 4" CL 1" 6" CSBC

10.07.3 Requirements for Engineered Pavement Sections

Engineered pavement designs should follow the latest "AASHTO Guide for Design of Pavement Structures" for flexible pavements and be based on the following criteria:

10.07.3.1 Pavement Design Requirements

For projects where a traffic analysis report was not required, to determine the amount of traffic for which a street should be designed, contact the City to obtain the most recent street classification and traffic counts. Traffic counts are done assuming there is a 50/50 split in the direction of traffic. One hundred percent of the 50/50 split must be assumed in the design lane, regardless of the number of lanes in each direction. (Additional traffic information may be required.)

The existing traffic levels shall then be inflated to match the projected traffic at the end of the roadways design life (in most cases a twenty-year design life will be used). The rate of growth is one and a half percent (1.5%) for residential streets and three and a half percent (3.5%) for commercial/industrial streets and arterials streets. The one and a half percent (1.5%) growth can be waived in closed subdivisions with City approval.

The Reliability Level factors used in pavement design shall be in accordance with the following table:

Table 10-6 Pavement Design – Reliability Factors

Functional Classification	Required Level of Reliability	
	Urban	Rural
Principal Arterials	95	90
Minor Arterials	90	
Collectors	90	
Local	85	

10.07.3.2 Soils Classifications and California Bearing Ratio

Prior to designing the pavement thickness, the soils condition of the area in which the road or street is to be built shall be evaluated and classified. The existing soil shall be tested to determine the bearing capacity via in-situ testing or laboratory testing. The classification and the tested soil properties shall then be documented and used in the pavement design.

10.07.3.2.1 Poor Soils

These soils are relatively soft and plastic when wet and may contain appreciable amounts of clays and silts. These soils would be classified as SC, ML, CL, OL, MH, CH, or as OH as per the Unified Soils Classification System.

10.07.3.2.2 Medium Soils

These soils are relatively firm when wet and may contain some amounts of silt. These soils would be classified as SP, SM, or SC as per Unified Soils Classification System.

10.07.3.2.3 Good Soils

These soils retain a substantial amount of their load-bearing capacity when wet. These soils would be classified as GM, GC, SW, or SM as per the Unified Soils Classification System.

10.07.3.2.4 Excellent Soils

These soils are basically unaffected by moisture or frost. These soils would be classified as GW, GP, GM, GC, SW, or SM as per the Unified Soils Classification System.

10.07.3.2.5 Unified Soils Classification Symbols

- GW: Well graded or gravel-sand mixtures with little or no fines.
- GP: Poorly graded gravels or gravel-sand mixtures with little or no fines.
- GM: Silty gravels or gravel-sand mixtures.
- GC: Clayey gravels or gravel-sand-clay mixtures.
- SW: Well graded sands or gravelly sands with little or no fines.
- SP: Poorly graded sands or gravelly sand mixtures with little or no fines.
- SM: Silty sands or sand silt mixture.
- SC: Clayey sands or sand-clay mixtures.
- ML: Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silty that are slightly plastic.
- CL: Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
- OL: Organic silts and organic silt clays of low plasticity.
- MH: Inorganic silts, micaceous or diatomaceous fine sand or silty soils, elastic silts.
- CH: Inorganic clays of high plasticity, fat clays.
- OH: Organic clays of medium to high plasticity and organic silts.

10.07.3.3 Report Submittal

The applicant must submit a roadway analysis report to the City of Auburn, including a narrative of the site conditions, geotechnical boring logs, testing results, calculations, the pavement analysis, and applicable background information for review and approval. The report must contain all calculations regarding the pavement design including, spreadsheets, all variables and assumptions, as well as geotechnical engineering information on the subgrade soils. (Note: The soils classification in **Section 10.07.3.3** is not a substitute for tests to support soil bearing capacity.)

10.07.4 Materials Specifications

The following material requirements are referenced from the City of Auburn's Engineering Construction Standards Manual and WSDOT Standard Specifications and are subject to change. For the most current definitions, please reference the Construction Standards Manual.

10.07.4.1 Gravel Base

Gravel base shall be bank run gravel or gravel borrow, defined as naturally occurring material having characteristics such that when compacted in place on the roadway, it will provide a course having greater supporting value than the subgrade on which it is placed. It shall be from a pit approved by the City Engineer and shall meet gradations specified in **Division 9-03.10** of the WSDOT Standard Specifications.

10.07.4.2 Crushed Rock

Crushed rock use in City street construction will fall under the following two classifications:

- A. Crushed Surfacing Top Course (CSTC)
- B. Crushed Surfacing Base Course (CSBC)

CSTC and CSBC shall be in accordance with **Section 9-03.9(3)** of the WSDOT Standard Specifications.

10.07.4.3 Asphalt Concrete Pavement

Asphalt use in City street construction will typically fall under the following two classifications:

- A. HMA Class 1-inch PG 64-22
- B. HMA Class 1/2-inch PG 64-22

Asphalt Concrete Pavement shall be in accordance with WSDOT Standard Specifications and the City's Engineering Construction Standards Manual.

10.07.5 Permeable Pavements for Roads, Access Tracts, and Driveways

Pervious Cement and Porous Asphalt Concrete Pavement within roads, access tracts, and driveways must be designed by a Washington State licensed professional engineer. The design shall be documented by a report that includes relevant calculations, data collection, and assumptions. The report must provide evidence that the permeable surfaces are designed to have at least a 30-year service life given the anticipated vehicle counts and classifications. The minimum pavement design section shall be as follows:

6-inch thick wearing course of porous asphalt or pervious concrete; over

6-inch to 36-inch thick reservoir course (Permeable Ballast per Section 9-03.9(2) of the Construction Standards); over

Geotextile (Non-Woven, Moderate Survivability per Section 9-33.2(1) of the Construction Standards); over

Where treatment is required per the SWMM: 18-inch to 24-inch runoff treatment layer with specifications per the SWMM.

Permeable pavements shall be designed and constructed per the SWMM and the Construction Standards. Maximum allowed longitudinal slopes for pervious pavements shall be 5%. Longitudinal slopes exceeding 2% shall require check dams or other methods to maximize ponding in the subsurface to allow adequate treatment and infiltration. Underdrains shall not be allowed.

Pervious cement and porous asphalt concrete pavement within the public right-of-way shall not be utilized for storm water management of runoff from areas outside the public right-of-way.

10.08 Landscaping

10.08.1 General Landscaping Requirements

An area devoted to landscaping is included within the right-of-way of all street classifications. This landscape strip is an integral part of the roadway cross-section. It serves several important functions, including improving pedestrian safety by providing a buffer between traffic and the sidewalk; providing the perception of a narrower travel corridor, thereby slowing traffic; improving air quality; and improving the aesthetic appearance of the street. Landscape strips may also be constructed as bioretention swales to provide storm water collection, treatment, and infiltration. Located between the sidewalk and the street, landscape strips are frequently used by pedestrians, hence they should not contain shrubs for these can create a tripping hazard. Shrubs with a mature height not greater than 3 feet are however often appropriate in medians, entry features and other landscaped areas in the public right of way not traversed by pedestrians.

The applicant shall design and install the landscape strip in accordance with these design standards. The proposed design shall be reviewed and approved by the City.

Landscape strips are required for local residential streets and residential collector streets. The minimum width required for landscape strips is five feet (5'). Landscape strips shall be located between the back of the curb and the sidewalk. The applicant shall provide for and plant street trees within the landscape strip in accordance with these design standards.

Street trees are required for principal arterials, minor arterials, non-residential collectors, local residential, and local non-residential streets. Street trees shall be placed either within the sidewalk in tree pits with tree grates, in landscape strips, or in bioretention swales, and spaced in accordance with the standards identified in **Section 10.08.5.1**.

10.08.2 Landscape Strip Components

Landscape strips contain several components. These include soil, the plants themselves, structural items such as root barriers and tree grates, and may include street furnishings such as luminaries, traffic signs, bus stops or shelters, benches, and mail boxes.

10.08.3 Landscape Strip Dimensions

Landscape strips and bioretention swale requirements:

- Roadways, driveways, lighting, fire hydrants, junction boxes, water meters and other appurtenances shall be configured such that no landscape strip has a net landscaped surface area (landscape strip area minus areas occupied by non-landscape features) of no less than 50 square feet and no portion of a landscaped surface has a width less than 2 feet. To satisfy these size requirements, landscape strip areas may not be "filled in" with sidewalk, driveway, or other non-landscaped surfaces. Instead, the alternate roadway sections shown in **Figure 10-06A and 10-06B** shall be utilized to ensure that the minimum landscape size requirements are met. These minimum size requirements shall also apply to bio-retention swales.
- In order to meet the minimum size and width requirements listed above, landscape strips/areas may be omitted from one side of the roadway and widened to 8.5 feet wide on the other. The width of the sidewalk on the side of the omitted landscape strip is required to be increased to 7.5 feet.

No parking shall be signed on the side of the widened landscape area. See **Figure 10-06A**. The configuration shall be alternated (the side with the landscape strip/area switched from one side to the other) to support traffic calming and drainage.

- Widened landscape strips/areas may be constructed as bioretention swales as shown in **Figure 10-06B**. Bioretention swales in the public right-of-way shall be designed to collect, treat, and infiltrate runoff from the public right-of-way. If, after runoff from the public right-of-way has been accounted for, additional capacity remains in the bioretention swale, the bioretention swale may be utilized to treat and infiltrate runoff from adjacent private single family residential property(s) with a maintenance agreement between the City and property(s) draining to the swale that requires those property(s) to maintain the swale in perpetuity. The bioretention swale shall be designed and constructed in accordance with the SWMM.

10.08.4 Plant Layers

In order to balance a safe walking environment and improved aesthetics and air quality, a multilayer planting approach is recommended in the landscape strip. For instance, grass or an approved ground cover should be used at the ground level. Properly spaced trees form the upper or canopy level. Within this general framework are many choices, outlined in the Plant Selection section below.

In summary, the landscape strip will contain the following layers:

1. **Ground Cover(s) or Grass**—Required
2. **Trees**—Required

10.08.5 Trees

10.08.5.1 Placement and Spacing

Trees shall be placed so that they do not obstruct the view of any street intersection, driveway, or visibility of any traffic control device or sign. Sight distance triangles shall be used to analyze visibility at street intersections. Trees shall be centered in the landscape strip. When a landscape strip is not required, trees shall be placed in tree wells with tree grates within the sidewalk per **Standard Detail T-30**.

Nearby features such as street lighting, in-ground utilities, buildings or overhead wires will also affect where trees should be located. Minimum size for street trees shall be a two inch (2") caliper, measured two feet (2') above the root ball.

Minimum spacing for street trees should be 1 1/2 times the mature diameter of the tree canopy as identified in **Table 10-7A**.

Planting Next to a Building: Where a building is placed close to the sidewalk, the mature size of a tree should be considered when selecting species. Trees with a pyramidal, columnar, or oval shaped canopy are preferable; a tree with a round head is generally unsuitable in this situation.

Overhead Wires: When trees must be planted directly under or when the mature canopy is within twelve feet (12') of overhead utility lines, species with a mature maximum height of twenty-five feet (25') must be selected.

Street Lighting: Trees need to be located at least half their mature canopy width or twenty feet (20') from light standards, whichever is greater. Planting locations should be coordinated with locations of lighting standards.

Street Signage: Trees shall be planted to avoid blocking the view of street signage.

Underground Utilities: Trees shall be planted so as to avoid impacts on underground utilities.

Clearance: Trees shall be pruned as they grow to provide at least seven feet (7') vertical clearance above sidewalks and fourteen feet (14') of vertical clearance above roadway surfaces.

10.08.5.2 Tree Canopy Shape

Tree canopy shapes are an important factor in the selection of street trees. The setting will often dictate which canopy shapes are most appropriate. This in turn will aid in the selection of the most suitable species.

The guidance offered below includes information about which tree canopy shapes work best under different conditions. **Table 10-7A** offers information about tree species and their canopy shapes.

10.08.5.2.1 V-Shaped Trees

V-shaped (sometimes also called “vase shaped”) trees have canopies that are narrow toward the bottom and broad at the top. The American Elm is a classic street tree with this shape. V-shaped trees may have arching branches that form a canopy over both street and sidewalk. They generally do not cause problems with overhead power lines or traffic.

10.08.5.2.2 Pyramidal Trees

Pyramidal or cone-shaped trees are typically broad at the base of the canopy and are somewhat pointed at the top. Planted close together, pyramidal trees can screen unwanted views or create vistas. Lower branches sometimes droop with age and may have to be limbed up in later years to provide the needed clearance.

10.08.5.2.3 Round Trees

These are generally wide spreading trees that need more space than other shapes.

10.08.5.2.4 Oval Trees

Oval trees are taller than they are wide and cause less interference with traffic.

10.08.5.2.5 Columnar Trees

Columnar trees are useful in locations where there is little available room between the street and buildings, awnings, or other features. Branches of columnar trees tend to grow up rather than out. Many branch lower than other types of trees without causing problems with traffic or pedestrians.

10.08.5.3 Root Direction Devices

All street trees planted within a landscape strip shall use a root direction device to deflect tree roots downward into the soil. Any tree planted on public property within 10 feet or less of a sidewalk or curb shall be planted with a root directional device. These devices are used to eliminate damage to sidewalks as the tree roots extend beyond the original planting pit.

The root barrier should be placed along two sides of the tree, parallel to the sidewalk and to the curb line. Under specific circumstances, wider strips that contain utilities may also need root barriers to reduce conflicts. Plan submissions should indicate the location of root barriers and provide a specification sheet on the product to be used.

10.08.5.4 Tree Planting Wells and Grates

See Standard Detail T-06.

In highly urbanized settings such as downtown, it may be necessary to install street trees into an existing street and sidewalk setting. Where high levels of pedestrian traffic are expected, it may be necessary to place trees into a paved area rather than a landscape strip. In these situations, planting wells and grates may be necessary. The desirable size for a tree planting well is thirty-six square feet (36 sq.) or greater. A minimum of twenty-five square feet (25 sq.) should be provided.

Where trees are within a heavily traveled pedestrian area, their roots can be easily damaged. In these areas tree grates or other means such as pavers in sand will be required to protect the health of the tree.

Where tree wells or grates are necessary, provide planting details, specifications, and product sheets for proposed tree-planting wells and tree grates.

10.08.6 Plant Selection

There are innumerable plant choices for each layer of the landscape strip. Selection is based on:

- **Size** of the landscape strip
- **Canopy shape** of trees
- **Size and type** of leaves
- **Root shape**
- **Site environmental conditions**, such as the amount of sunlight available or moisture in the soil; and
- **Aesthetic** qualities desired.

Needled evergreens shall NOT be used in landscape strips, unless the strips are very wide.

10.08.7 Plant Selection Table

Table 10-7A provides several acceptable species of trees. Many other trees are appropriate and alternative selections may be proposed if desired. Alternative plant choices must be evaluated and approved by the City.

Column Headings: A short description of several of the column headings follows:

Height and Canopy Width (in feet):

Trees vary considerably in height and mature width and these dimensions are identified per species to ensure that the right tree is being planted in the right location.

Landscape Strips/Wells and Grates and Median:

This section identifies which species are appropriate to be planted in these locations

Sun:

Sun	Needs full sun
Sun/Shade	Takes sun to part shade; needs at least ½ day of sun
Shade	Shade to part shade. Protect from full sun, especially in afternoon

H₂O Req. (Requirement):

Low	Drought tolerant after 1 st year
Mod	Moderate water need. May need supplemental watering during dry season.
High	Requires irrigation

Canopy Shape:

"V"	V-shaped Trees (sometimes also called "vase shaped trees")
Pyramid	Pyramidal trees or cone shaped trees
Round	Round trees
Oval	Oval trees
Col.	Columnar trees

See Table 10-7A with Tree Matrix.

TABLE 10-7A (TREES FOR THE PUBLIC RIGHT-OF-WAY ENVIRONMENT)												
Botanical Name	Common Name	Mature Height (ft.)	Mature Canopy Width (ft.)	Min. Landscape Strip Width		Planting OK?		Leaf Size	Canopy Shape	H2O Req	Sun	Remarks
				5'-6'	>10'	Wells & Grates	Median					
Acer campestre	Queen Elizabeth Maple 'Evelyn'	35	30	x	x	x		2"-4"	Oval	Mod	Sun/part. sun	Hardy tree
Acer freemanii	Autumn Blaze Maple	50	40		x		x	4"-8"	Oval	Mod	Sun	Fast Growing
Acer ginnala	Amur Maple 'Flame'	20	20	x	x	x		1.5"-3"	Round	Mod	Sun/part. sun	Good power line tree.
Acer grandidentatum	Rocky Mt Glow Maple 'Schmidt'	25+	15	x	x	x	x	4"-8"	Round	Mod	Sun/part. sun	Requires pruning for clearance
Acer nigrum	Green Column Maple 'Green Column'	50	20	x	x	x	x	4"-8"	Col	Mod	Sun/part. sun	
Acer platanoides	Norway Maple 'Emerald queen'	50	40		x		x	4"-8"	Oval	Mod	Sun/part. sun	Popular variety
Acer platanoides	Norway Maple 'Columnar'	40	15	x	x	x	x	4"-8"	Col	Mod	Sun/part. sun	Good street tree
Acer rubrum	Bowhall Maple 'Bowhall'	40	15	x	x	x	x	2"-4"	Upright/round	Mod	Sun/part. sun	tolerant of wet soil
Acer rubrum	Scarlet Sentinel Maple 'Scarsen'	40	20	x	x	x	x	2"-4"	Col	Mod	Sun/part. sun	tolerant of wet soil
Acer rubrum	Karpick Maple 'Karpick'	35-40	20	x	x	x	x	2"-4"	Col	Mod	Sun/part. sun	
Acer saccharum	Sugar Maple 'Green Mountain'	45	35		x		x	3"-6"	Oval	Mod	Sun/shade/part. sun	
Acer truncatum x A. platanoides	Pacific Sunset Maple 'Warrens Red'	30	25	x	x	x	x	4"-8"	Round	Mod	Sun	Good fall colors
Amelanchier x grandiflora	Serviceberry 'Princess Diana'	20	15	x	x	x		2"-4"	Upright/round	Mod	Sun/part. sun	Small tree, red in fall
Amelanchier x grandiflora	Serviceberry 'Autumn brilliance'	20	15	x	x	x		2"-4"	Upright/round	Mod	Sun/part. sun	Resistant to ice breakage
Carpinus betulus	Pyramidal European Hornbeam 'Fastigiata'	35	25	x	x	x	x	2"-4"	Col	Low	Sun/part. sun	Very urban tolerant, good street tree

TABLE 10-7A (TREES FOR THE PUBLIC RIGHT-OF-WAY ENVIRONMENT) <i>continued</i>												
Botanical Name	Common Name	Mature Height (ft.)	Mature Canopy Width (ft.)	Min. Landscape Strip Width		Planting OK?		Leaf Size	Canopy Shape	H2O Req	Sun	Remarks
				5'-6'	>10'	Wells & Grates	Median					
Carpinus betulus	Frans Fontain Hornbeam	35	15	x	x	x	x	2-4 "	Col	Mod	Sun	
Cercidiphyllum japonicum "Rotfuchs"	Red Fox Katsura	30	16	x	x	x	x	4"	Oval	Mod	Sun	
Fagus sylvatica	Green Beech	50	40		x		x	5"	Oval	Mod	Sun/ part. sun	Does not like wet soil
Fagus sylvatica	Dawyck Purple Beech 'Dawyck Purple'	40	12	x	x	x	x	2"-4"	Col	Mod	Sun/ part. sun	Purple leaves
Fagus sylvatica	Red Obelisk	35	12	x	x	x	x	2 - 4 "	Col	Mod	Sun	
Fraxinus americana	Ash 'Autumn Applause'	40	25	x	x	x	x	2"-4"	Oval	Low	Sun/ part. sun	Deep red fall colors
Fraxinus oxycarpa	Raywood Ash 'Raywood'	45	30	x	x	x	x	2"-4"	Oval	Low	Sun	
Fraxinus pennsylvanica	Leprechaun Ash 'Johnson'	18	16	x	x	x	x	2"-4"	Round	Mod	Sun	Good power line tree.
Fraxinus pennsylvanica	Ash 'Urbanite'	50	40		x		x	2"-4"	Pyramid	Low	Sun	
Fraxinus pennsylvanica	Patmore Ash 'Patmore'	45	35	x	x	x	x	2"-4"	Oval	Low	Sun	Very good tree
Ginkgo biloba	Ginkgo 'Autumn Gold' (Male Trees Only)	45	35	x	x	x	x	2"-4"	Oval	Mod	Sun/ part. sun	Use males only
Ginkgo biloba	Ginkgo 'Princeton Sentry' (Male Trees Only)	40	15	x	x	x	x	2"-4"	Col	Mod	Sun/ part. sun	Use males only
Liriodendron tulipefera	Tulip Tree	60	30		x		x	4"-6"	Oval	Mod	Sun	Extremely large tree
Liriodendron tulipifera	Tulip tree 'Arnold'	60	30		x	x	x	4"-8"	Oval	Mod	Sun	Grows extremely large
Malus	"Marilee"	24	10	x	x	x	x	2"-4"	Cone	Mod	Sun	No fruit. Good power line tree.
Nothofagus antartica	Southern Beech	50	35		x		x	2"-4"	Round	Mod	Sun	
Plantus x acerifolia	Planetree 'Yarwood'	50	40		x			6"-7"	Round	Mod	Sun	Bark defoliates
Prunus	Mt. St. Helens Plum 'Frankthrees'	20	20	x	x	x	x	2"-3"	Round	Mod	Sun	Hardy tree. Good power line tree.

TABLE 10-7A (TREES FOR THE PUBLIC RIGHT-OF-WAY ENVIRONMENT) <i>continued</i>												
Botanical Name	Common Name	Mature Height (ft.)	Mature Canopy Width (ft.)	Min. Landscape Strip Width		Planting OK?		Leaf Size	Canopy Shape	H2O Req	Sun	Remarks
				5'-6'	>10'	Wells & Grates	Median					
Prunus	Snow Goose Cherry 'Snowgoose'	20	20	x	x	x		2"-4"	Upright spreading	Mod	Sun	Disease resistant. Good power line tree.
Prunus cerasifera	Flowering Plum 'Krauter Vesuvius'	30	15	x	x	x	x	2"-4"	Round	Mod	Sun	
Prunus sargentii	Cherry 'Columnarus'	35	15	x	x	x	x	4"-8"	Col	Mod	Sun	Fast grower.
Prunus serrulata	Flowering Cherry 'Amanogowa'	20	6	x	x	x	x	2"-4"	Vase	Mod	Sun/part. sun	Short lived. Good power line tree.
Prunus x hillieri	Cherry 'Spire'	30	10	x	x	x	x	2"-4"	Col	Mod	Sun/part. sun	Good fall colors.
Prunus x yedoensis	Flowering Cherry 'Akebono'	25	25	x	x	x		2"-4"	Round/vase	Mod	Sun	Best pick for region. Good power line tree.
Pyrus calleryana	Pear 'Capital'	35	12	x	x	x		2"-4"	Col	Mod	Sun	Susceptible to fire blight.
Pyrus calleryana	Pear 'Aristocrat'	40	28	x	x	x	x	2"-4"	Pyramid	Mod	Sun	Susceptible to fire blight
Pyrus calleryana	Pear 'Redspire'	35	25	x	x	x	x	2"-4"	Pyramid	Mod	Sun	Susceptible to fire blight
Pyrus calleryana	Pear 'Autumn Blaze'	30	25	x	x	x		2"-4"	Round	Mod	Sun	Susceptible to fire blight
Quercus	Crimson Spire Oak 'Crimschmidt'	45	15	x	x	x	x	4"-8"	Round	Mod	Sun	
Quercus robur	Skyrocket Oak 'Fastigiata'	45	15	x	x		x	4"-8"	Oval	Mod	Sun	Good street tree
Styrax japonica	Japanese Snowbell	25	25				x	2"-4"	Round	Mod	Sun/part. sun	Slow growing. Good power line tree.
Tilia americana	Linden 'Redmond'	35	20	x	x	x	x	4"-8"	Pyramid	Mod	Sun/part. sun	tolerant to wet soil
Tilia cordata	Linden 'DeGroot'	30	20	x	x	x	x	2"-4"	Pyramid	Mod	Sun/part. sun	
Tilia cordata	Chancelor Linden 'Chancole'	35	20	x	x	x	x	2"-4"	Pyramid	Mod	Sun/part. sun	Good street tree
Tilia cordata	Linden 'Greenspire'	40	30	x	x	x	x	2"-4"	Pyramid	Mod	Sun/part. sun	Tolerant to difficult conditions
Zelkova serrata	Zelkova 'Village Green'	40	38		x		x	1"-3"	Vase	Mod	Sun	Good tree

Table 10-7B provides several acceptable species of ground covers and, shrubs less than 3 feet high. Many other types of plants may be appropriate and alternative selections may be proposed if desired. Alternative plant choices must be evaluated and approved by the City.

See **Table 10-7B**.

TABLE 10-7B (GROUND COVER/LOW SHRUBS)						
Botanical Name	Common Name	Mature Height (ft.)	Minimum Planting Area Width (ft.)	Sun	Obvious Flowers	Remarks
Arctostaphylos Una-Ursi	Kinnikinnick Bearberry	0.5' to 1'	5 to 6'	Full sun to partial shade	Yes	Useful on slopes, poor or dry soils. Slow to establish; must be weeded early.
Ceanothus Gloriosus	California Wild Lilac	1.5'	6' to 8'	Full sun	Yes	
Cotoneaster Dammeri	Bearberry Cotoneaster	< 2'	5 to 6'		Yes	Fast growing
Euonymus Fortunei Coloratus	Purple Leaf Winter Creeper	1.5'	6' to 8'	Full sun to light shade	Yes	
Hypericum Calycinum	St. John's Wort	1' to 1.5'	2'	Full sun to partial shade	Yes	
Juniperus Horizontalis	Blue Chip Juniper/Hughes Juniper	1'	6' to 8'	Full sun	No	
Microbiota Decussata	Siberian Carpet Cypress	1.5'	7' to 8'	Full sun to light shade	No	
Rubus Calycinoides	Evergreen Bramble	1'	6'	Full sun	Yes	
Vinca Minor	Periwinkle	0.5'	1.5'	Full sun to partial shade	Yes	

10.08.8 Planting Methods and Maintenance

Good horticultural practice should be employed in the preparation of the soil and planting pits. This will include:

1. Conserving topsoil and replacing it on the site.
2. Performing soil tests.
3. Providing corrective soil preparation as necessary.

10.08.9 Establishment Period

The developer will be responsible for maintaining the trees and plants in the public landscape strip, medians and entry features in a healthy condition for one (1) year after acceptance of the project. For landscape strips that do not include irrigation, maintenance will include providing water during dry periods. Weeds, diseases, and insect pests must also be controlled.

10.08.10 Irrigation Systems

Irrigation systems shall not be allowed in the public right of way without a right-of-way use permit. Irrigation systems shall adhere to the standards specified in the City of Auburn Construction Standards.

10.09 Mailboxes

See Standard Details T-07 thru T-09.

Locating and installing mailboxes in connection with the construction or reconstruction of a City street shall follow AASHTO and Post Office guidelines.

10.09.1 Mailbox Locations

Mailboxes shall be located a minimum of two feet (2') back from the face of curb on streets which have a curb. For streets without a curb, setbacks shall be determined using AASHTO standards. When locating mailboxes, access, sight distance, and landscaping requirements shall be taken into account. Final locations shall be detailed on the civil plans and approved by the serving Post Office and the City.

When mailboxes are located in the sidewalk, individually or in clusters, sidewalks shall be widened to provide a minimum five feet (5') of clearance around the mailboxes. Widening of the sidewalk may require the dedication of additional right-of way.

10.09.2 Mailbox Installation

The owners or residents served by mailboxes will install and thereafter maintain their own individual, clustered, or separated mailboxes as instructed by the U.S. Postal Service.

10.10 Illumination

10.10.1 General

The City desires to have safe and uniform lighting standards for streets to allow safe comfortable use by all users. The City has approved standard lighting infrastructure for reliability and ease of parts inventory and maintenance. Roadway lighting is required along all City owned streets except classified Rustic Collectors and Rustic Residential Collectors. Street lighting design shall be in conformance with the design criteria in the most recent edition of the IES Lighting Handbook (Illuminating Engineering Society of North America) and applicable WSDOT and City of Auburn Construction Standards.

10.10.2 Design

All City street lights/luminaire shall be LED as specified in the City of Auburn Construction Standards, Part 1 – Special Provisions.

The City of Auburn prefers staggered lighting on all Principal and Minor Arterials. Single sided lighting may be acceptable if approved by the City. Local Residential streets will have a choice between a standard light and an ornamental alternative. **Table 10-6** has been included as a general guideline for determining illumination sizing and location requirements. Project specific lighting calculations shall be provided to insure minimum illumination levels will be met. Light level calculations shall be done ignoring any existing substandard luminaires (PSE lights on wood poles, etc.).

All poles and bracket arms shall be designed for the street lighting luminaire with a minimum weight of fifty pounds (50 lb.) and to withstand pressures caused by wind loads of ninety miles per hour (90 mph) with a gust factor of 1.3.

Special consideration shall be given for light levels at crosswalks, curves, conflict points and street ends and shall be designed to meet the minimum light level of 0.2-foot candle. Roadway lighting levels also are impacted by the type of pavement surfacing and special consideration shall be given for surfaces like concrete roadways.

When pedestrian lighting is used the street light design shall be done independent from the influence of the pedestrian lighting. Pedestrian light spacing shall not exceed five times the mounting height. When pedestrian lighting is installed, sidewalk lighting shall be designed for two foot (2') candles.

All illumination plans shall include a lighting schedule. Each luminaire shall be numbered such that the circuit number, the mounting height, davit length and wattage are clearly indicated.

For Boulevard streets, streets with median islands, double arm street lights in the median may be allowed meeting all applicable design criteria of these standards. In addition, access accommodations allowing for light maintenance vehicles to park outside the travel way must be incorporated into the median island design.

The locations of street lights shall take into consideration any obstacles which may screen or impede lighting levels such as street trees and awnings. Street trees shall be located a minimum of twenty feet (20') from all streetlights.

10.10.3 Lighting Schedule

The following Light criteria is based on the roadway classifications for a typical straight roadway section with a staggered lighting configuration. Wider road sections, curves, intersections, cul-de-

sacs and single sided lighting configurations must use a calculated design meeting the criteria on **Table 10-8**.

Table 10-8 Lighting Design Criteria

Street Classification	Street Width (feet)	Lamp Wattage **	Average Maintained Light Level (foot-candle)	Required Uniformity Ratio	Minimum Light Level (foot-candle)	Luminaire Mounting Height (feet)	Davit Arm Length (feet)
Principal Arterial	61	400	1.4	3 To 1	0.2	35 40	12
Minor Arterial	50/61	250	0.9	3 To 1	0.2	35	10
Non-Residential Collector	44	250	0.9	3 To 1	0.2	35	6
Residential Collector	34	150	0.6	3 To 1	0.2	30	6
Local Non-Residential	34	150	0.6	3 To 1	0.2	35	6
Rustic Collector and Rustic Residential *	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Local Residential	28	100	0.4	6 To 1	0.1	30	8
Local Residential Ornamental Alternative	28	100	0.4	6 To 1	0.1	12	N/A

*Illuminate Signalized Intersections only.

** Lamp wattage shown refers to the equivalent wattage for standard high pressure sodium bulbs. The equivalent LED lamps shall be provided.

For downtown pedestrian lighting requirements, contact the City of Auburn.

10.10.4 Light Standard Foundations

All light poles shall be placed on a foundation. Foundations for light standards shall conform to **Standard Details T-19, T-28, or T-28A**.

Light pole foundations adjacent to sidewalks shall include a four inch (4") concrete pad and conform to **Standard Detail T-18**.

10.10.5 Service Cabinet

See Standard Detail T-21.

All new luminaires shall be connected on an electrical circuit that is connected to a power source through a service cabinet. Service cabinets shall conform to **Standard Detail T-21** and shall be metered with a photocell installed for luminaire control. The service cabinet shall be within fifty feet (50') of the Puget Sound Energy (PSE) point of service connection.

Service cabinets should be installed behind the sidewalk when possible at locations that do not impede maintenance access. The cabinet should be located in the center of the system so there are a near equal number of lights being served on separate circuits from each side of the cabinet. The cabinet shall be labeled with "COA Lighting" and service site address.

The number of luminaires per service will be based upon the type of luminaire and the capacity of the service. Testing may be required to determine if additional luminaires may be added to an existing service.

10.10.6 Service Cabinet Foundations

See Standard Detail T-21.

The Service Cabinet foundation shall conform to **Standard Detail T-21.**

10.10.7 Conduit

Street light conduit shall be Schedule 40 PVC-ASTM D1785. All conduits for street crossings shall be Schedule 80 PVC-ASTM D1785. All conduits installed under sidewalk and driveway areas shall be Schedule 40 PVC-ASTM D1785. Conduit type shall not change within a run. Conduits installed under paved roadway, not crossing the roadway, shall be Schedule 80 PVC-ASTM D1785. Conduits shall have a minimum of twenty-four inches (24") of cover. The City requires that street light conduit be extended through a property's frontage for future expansion of the lighting system.

10.10.8 Junction Boxes

See Standard Detail T-20.

- A. Street Junction boxes shall conform to **Standard Detail T-20**. Junction boxes shall be of the type specified on the plans and shall conform to the requirements of **WSDOT Standard Plan J-40.10**. All junction boxes shall be locking.
- B. Type 1 junction boxes shall be located adjacent to the sidewalk within the landscaping strip, if provided, or adjacent to the back of sidewalk if a landscape strip does not exist, or within the shoulder of a non-curbed roadway.

10.10.9 Light Standards

- A. STANDARD LUMINAIRE

See Standard Detail T-19.

Lighting standards shall be tapered aluminum, davit-style units, with five feet nine inch (5'9") radius per **Section 9-29.6(1)A** (Lighting Standards and Davit Arms, of the City of Auburn Engineering Construction Standards), and shall be installed in conformance with **Standard Details T-18 and T-19.**

DOWNTOWN STREET LIGHTING LUMINAIRE

See Standard Detail T-28.

Light standards located within the Downtown Urban Center as depicted on the Comprehensive Zoning Map shall be per the referenced detail above.

DOWNTOWN PEDESTRIAN LUMINAIRE

See Standard Details T-28, T28A & T-28B.

Pedestrian light standards located within the Downtown Urban Center as depicted on the Comprehensive Zoning Map shall be per the referenced detail above.

B. LOCAL RESIDENTIAL ORNAMENTAL ALTERNATIVE LUMINAIRE

See Standard Detail **T-29**.

The Local Residential Ornamental Alternative light standard shall conform to Standard Detail **T-29** and shall be Holophane Wadsworth series fluted shaft with seventeen-inch (17") diameter base (W12F4/17CA/BK or DG) and may be used in residential plats in place of the standard luminaire.

C. ANCHOR BASES

Anchor bases per **Section 9-29.6(2)** (Anchor Bases, of the City of Auburn Engineering Construction Standards) shall conform to the Standard Detail **T-19, T-28, or T-29**.

10.10.10 Light Standard Handholes

See Standard Detail **T-19**.

Light Standards handholes shall be four inches by six inches (4"x 6") nominal non-flush type in accordance with **Standard Detail T-19 with tamper resistant screws**.

10.10.11 Photoelectric Controls

Photocells installed on the service cabinet shall be "SST" Series model "SST-IES" or approved equal in conformance with **Section 9-29.11(2)** (Photoelectric Controls) of the City of Auburn Engineering Construction Standards. A bypass switch shall be required inside the service cabinet, clearly marked PE Bypass. One photocell will be required per service cabinet.

10.10.12 Luminaires

A. Luminaires shall meet the general requirements of **Section 9-29** (Illumination, Signals, Electrical) of the City of Auburn Engineering Construction Standards with the following modifications:

1. Street and Pedestrian Luminaires shall operate on 240 Volt AC and all luminaires shall be full cutoff.

B. All luminaires and circuits shall conform to **Table 10-9** below:

TABLE 10-9

Wattage	Max. Luminaires Per Circuit
100	14
150	12
250	8
400	7

C. All luminaires shall be provided with markers for positive identification of light source and wattage per **Section 9-29.10** (Luminaires) of the City of Auburn Engineering Construction Standards. A maximum of five percent (5%) voltage drop across each

circuit will be permitted. Voltage drop calculations will be required for all non-standard illumination systems.

10.11 Survey Monuments

See Standard Details T-11

Survey monuments shall be placed or replaced in accordance with WAC 332-120 (Survey Monuments – Removal or Destruction) and good practice in land surveying. Monuments are required along the centerline of improvement of all new or reconstructed streets. Monuments shall be placed at intersections, P.C. (points of curvature), and P.T. (points of tangency).

All existing survey monuments that are disturbed, lost, or destroyed during construction shall be replaced by a registered land surveyor registered in the State of Washington at the expense of the responsible builder or developer.

10.12 Guardrail

Evaluation of embankments for guardrail installations shall be in accordance with Chapter 710 of the WSDOT Design Manual.

Guardrail installations shall conform to **WSDOT Standard Plan C-1**, Beam Guardrail Type 1. End anchors shall conform to **WSDOT Standard Plan C-6**, Beam Guardrail Anchor Type 1.

10.13 Bollards

See Standard Detail T-03.

When necessary to deny vehicle access to an easement, tract, or trail (except for maintenance or emergency vehicles) the point of access shall be closed by a line of bollards. These shall include one or more fixed bollards on each side of the traveled way and removable, locking bollards across the traveled way. Spacing shall provide one bollard on centerline of the trail and other bollards at a maximum spacing of three feet (3') to preclude vehicular access. Bollard design shall be in conformance with **Standard Detail T-03**. Fire access roads shall not be blocked in this manner without the concurrence of the Fire Marshal. Bollards shall be ten feet (10') from the paved edge of roadway.

10.14 Transit Stops

This section provides the minimum design standards to be used in the design of bus transit facilities in the City of Auburn. Bus facilities shall be designed, located and installed in cooperation with appropriate operating transit agency.

When determined appropriate by the City Engineer, or if comments are made by a transit service agency, an applicant for new or expanded development is required to consult with King County METRO, or Pierce Transit to determine the practicality of how the site can be served by transit oriented improvements such as bus pullouts, bus stops, or other appurtenances.

10.14.1 Bus Pullout Requirements

Bus pullout lanes may be required where bus queuing or staging is required by the transit agencies operations and at the discretion of the City Engineer. The following are guidelines that would indicate pullouts would be appropriate:

- A. Traffic and passenger boarding and debarking conditions warrant.

- B. Traffic flow would be greatly hindered due to in lane stopping.
- C. The posted speed limit is in excess of thirty miles per hour (30 mph).

10.14.2 Locations for Bus Pullouts

Bus pullout locations shall meet the following requirements:

- A. Placement of bus pullouts shall be on the far side of signalized intersections and non-signalized intersections immediately following the intersection. Distance between pullouts should not be less than one thousand feet (1000').
- B. If far side pullouts are not possible, nearside pullouts will be evaluated. Mid-block pullouts are discouraged. If a situation arises where a mid-block bus pullout is the only option, pullouts should be constructed on both sides of a two-way street in a complementary pair.
- C. Maintaining adequate separation between access points, intersections, and bus pullouts can increase the safety and efficiency of both the roadway and the transit service.
- D. When locating a bus pullout consideration shall be given to existing access points and where passengers have safe and direct access to sidewalks, crosswalks, ramps, or other pedestrian facilities. Consideration shall also be given to trip attractors, and activity centers.
- E. Bus pullouts must meet sight distance requirements. See **Section 10.03**.

10.14.3 Design of Bus Pullouts

Bus Pullouts shall be designed in accordance with the applicable operating transit agency's guidelines. Designs must follow applicable guidelines for facilities used by the physically challenged (Americans with Disabilities Act). The King County Metro Transit Planning Office or Pierce County Transit should be contacted for specific design questions.

10.14.4 Bus Stop Requirements

Bus stops are located, designed and installed as part of a cooperative effort between the City and the operating transit agency. Bus stops are managed as part of a right of way use permit granted by the City to the operating transit agency. In general bus stop location and design decisions should follow the facility design guidelines of the operating transit agency. The King County Metro Transit Planning Office or Pierce County Transit should be contacted for specific design questions.

10.14.5 Locations for Bus Stops

In general bus stop location and design decisions should follow the facility design guidelines of the operating transit agency. The following are guidelines that indicate where bus stops are appropriate:

- A. Projected or existing passenger boarding and debarking demand warrant a stop.
- B. Traffic characteristics and street design make the location safe to stop a transit vehicle.
- C. The location meets the facility guidelines and fleet specifications of the operating transit agency.
- D. The stop is required to be accessible to the physically challenged (Americans with Disabilities Act).

10.14.6 Bus Stops Features

In general bus stop location and design decisions should follow the facility design guidelines of the operating transit agency. The following are some guidelines that would indicate what type of treatment would be appropriate by type of bus stop.

- A. Shelters should be installed at bus stops with an existing or estimated 25 or more boarding per day.
- B. Benches should be installed at bus stops with an existing or estimated 15 or more boarding per day.
- C. Trash receptacles should be installed and maintained by the operating transit agency at all bus shelters. A sign should be placed indicating that the shelter stop is maintained by the operating transit agency and giving specific contact information to report problems with the stop including a phone number.
- D. At all bus stops experiencing 15 or more boarding per day trash receptacles may be placed by the City or adopt a spot group and should be maintained by the City or the adopt a stop group.
- E. Information schedules and schedule holders shall be placed at all inbound stops (stops where buses are headed toward a major Central Business District), at all transfer points and at heavily used outbound stops.
- F. Additional bus stop lighting should be provided at locations where lighting levels are determined to be less than 3 foot candles.
- G. The stop should be accessible to the physically challenged (meeting the requirements of the Americans with Disabilities Act).

10.15 Traffic Control Devices

Traffic Control devices are all signs, signals, markings and other devices used to regulate, warn, or guide traffic. All traffic control devices shall meet the requirements of FHWA's latest adopted version of the Manual on Uniform Traffic Control Devices (MUTCD) and the standards herein.

10.15.1 Median Islands

Median Islands are raised barriers constructed between opposing lanes of travel. Median Islands are generally restricted to classified roadways and may be required in order to:

- 1. Control access along a corridor, or
- 2. Provide a traffic calming element.

10.15.1.1 Median Island Design

Median Islands shall be designed using the same geometric criteria as the street on which they will be constructed. Medians shall also meet the following requirements:

- A. **Median Ends:** Median ends shall be flared at intersections and at breaks to allow for transitioning traffic, ease of street sweeping and shall include signage in accordance with MUTCD requirements.
- B. **Width:** Median islands shall be a minimum curb to curb width of eight feet (8') when landscaped and a minimum of four feet (4') in width when paved.

- C. **Shy Distance:** One foot (1') minimum shy distance shall be maintained from face of median curbs to edge of travel lanes.
- D. **Landscaping/Paving:** Landscaping in medians shall conform to the requirements of **Section 10.08**. Median paving shall be stamped asphalt with colors and patterns approved by the City.
- E. **Irrigation:** Landscaped medians shall include irrigation systems.
- F. **Illumination:** Street lights on streets with median islands eight feet (8') in width and greater shall be located in the medians using dual arm posts and shall meet the minimum light level requirements of **Section 10.10**.
- G. **Maintenance Access:** Median islands eight feet (8') in width and greater shall provide a paved maintenance staging area fifty feet (50') in length with mountable curbs. Median islands smaller than eight feet (8') in width shall include one fifty foot (50') break in the median per block.

10.15.2 Traffic "C" Curbs

Traffic "C" Curbs are barrier curbs used for the restriction of turning movements and to aid in the channelizing of traffic, Traffic "C" curbs may be required in order to control access along a corridor within the restricted zones of any functional intersection boundary as defined in **Section 10.04**.

"C" Curbs constructed to retrofit existing roadways shall be constructed per **Standard Detail T-32**.

10.15.2.1 Traffic "C" Curb Design

Traffic "C" Curb layout shall be designed using the geometric criteria for channelization. An approved list of barrier curb products can be obtained from the Community Development & Public Works Department. Use of any Traffic "C" Curb products not on the approved list must be approved by the City Engineer and meet the following requirements:

- A. Shall be a National Cooperative Highway Research Program (NCHRP 350) approved product.
- B. Shall be constructed of all-weather, shatter and crumble resistant materials.
- C. Shall not restrict the flow of street surface drainage.
- D. Shall include MUTCD compliant reflective markings and vertical channelizing devices.

10.15.3 "Pork Chop" Islands

"Pork Chop" Islands are barrier islands used to restrict turning movements at driveways. They may be required at any driveway where left turns are restricted and Median Islands or Traffic "C" Curb installation is not feasible. When required, Pork Chops shall be accompanied by appropriate turn restriction signing and pavement markings.

10.15.4 Signing

All signing shall be per the "Manual on Uniform Traffic Control Devices" (MUTCD) and City of Auburn Engineering Construction Standards.

Developments shall be responsible for providing and installing all traffic control signs, including but not limited to street name signs, regulatory signs, warning signs, barricades, and bicycle/pedestrian signs as required.

Sign posts shall be installed per **Standard Detail T-24**.

Mast arm mounted street name signs shall be per **Standard Detail T-25**.

Post mounted street name signs shall be per **Standard Detail T-26**.

10.15.5 Pavement Markings

Pavement markings, raised markers, or striping shall be used to delineate channelization, lane endings, crosswalks, and longitudinal lines to regulate, warn or guide traffic. The City shall approve all channelization plans and crosswalk locations.

10.15.5.1 Crosswalks

See WSDOT Standard Plan M-15.10.

Crosswalks shall be installed at all intersections controlled by traffic signals and other areas approved by the City. Crosswalks shall be a piano key design consisting of white thermoplastic material. The position of the crossbars should be spaced in such a way as to allow the majority of wheel traffic to pass in the unpainted space.

10.15.5.2 Left-turn Channelization

See WSDOT Standard Plans M-3.20 & M-3.40.

Left-turn channelization shall include a minimum of one hundred fifty feet (150') of full-width lane to include storage and a reverse curve ninety feet (90') in length for posted speed up to forty-five miles per hour (45 mph). The reverse curve may be included in the taper distance. The standard width of a left-turn lane will be eleven feet (11'). Left-turn arrows per **WSDOT Standard Plan M-24.40** shall be installed twenty-five feet (25') behind the stop bar. Additional storage may be required for long vehicles or anticipated left-turn queues longer than the minimum storage. If storage length exceeds one hundred fifty feet (150'), auxiliary turn arrows will be installed at one hundred foot (100') intervals. Deviation requests from the minimum left turn lane storage requirements will need a traffic study submittal and approval by the City Engineer.

Left-turn Lane at End of Two-way Left-turn Lane

See WSDOT Standard Plan M-3.40.

Left-turn lane at the end of two-way left-turn lanes shall conform to **WSDOT Standard Plan M-3.40**.

Dual Left Turn

See WSDOT Standard Plan M-3.50.

10.15.5.3 Lane Division

See WSDOT Standard Plan M-20.10 and Standard Detail T-12.

All pavement markings used to separate or channelize traffic shall conform to the referenced Standard Plans and to the City of Auburn Construction Standards.

10.15.5.4 Painted Islands

Painted islands will be allowed on a case-by-case basis with approval from the City Engineer. Pavement markings for painted islands shall meet the MUTCD requirements.

10.15.5.5 Two-way Left-turn Lanes

See WSDOT Standard Plans M-3.20 & M-3.40

The installation of two-way left-turn lanes on City streets will be determined by the City based on street classifications and left turn requirements. The minimum width of a two-way left-turn lane shall be eleven feet (11'). The delineation lines shall be SBY (Single Broken Yellow) and a SSY (Single Solid Yellow) along the opposing lanes per the MUTCD. Two-way traffic arrows shall be spaced every one hundred fifty feet (150') along this lane. The designer should pay special attention to the beginning and endings of this type of lane and use clearly defined tapers or islands to maintain traffic safety.

10.15.5.5 Other Pavement Markings

Railroad crossing marking shall be per **WSDOT Standard Plan M-11.10**.

Right turn lanes shall be marked per **WSDOT Standard Plan M-5.10**.

10.15.6 Construction Area Temporary Traffic Control

The contractor shall be responsible to provide and maintain all signs, barriers, warning lights, striping, and flag control required for maintaining public safety in construction areas. Traffic control shall be maintained at all times when construction is in progress on all streets, and access points in the construction area.

Construction activities will not be allowed in the public right of way without an approved traffic control plan.

10.15.7 Roadway Barricades

Temporary and permanent barricades shall conform to the standards described in Section 6C-8 of the Manual on Uniform Traffic Control Devices (MUTCD).

- A. Type I or Type II barricades may be used when traffic is maintained through an area being constructed/reconstructed.
- B. Type III barricades may be used when streets are closed to traffic. Type III barricades may extend completely across the street (as a fence). Where provision must be made for access of equipment and authorized vehicles, the Type III barricades may be provided with movable sections that can be closed when work is not in progress, or with indirect openings that will discourage public entry. Where job site access is provided through the Type III barricades, the developer or contractor shall assure proper closure at the end of each working day.
- C. In the general case, Type III barricades shall be installed to close arterials or other through streets hazardous to traffic. They shall also be used to close off lanes where tapers are not sufficiently delineated.
- D. Type III barricades shall be used at the end of a local access street terminating abruptly without cul-de-sac bulb or on temporarily stubbed off streets. Each such barricade shall be used together with an end-of-road marker.

10.15.8 Traffic Signals

Traffic signals shall be designed and constructed in accordance with **Sections 8-20, 9-29**, and other applicable sections of the Construction Standards. WSDOT Standard Plans shall be utilized except the following elements that shall be per City of Auburn Standard Details:

Traffic Signal Controller and Foundation **Standard Detail T-22**

Telecommunication and Luminaire Electrical Trench **Standard Detail T-23**

10.16 Traffic Impact Analysis

The City of Auburn has established guidelines for Traffic Impact Analysis that are herein adopted by reference. These guidelines are used to identify capacity and safety concerns, to assist in the evaluation of site design as it relates to traffic engineering issues, and to identify appropriate solutions and mitigation.

To adequately assess a development's traffic impact, the City Engineer may require a Traffic Impact Analysis. The requirement for a Traffic Impact Analysis will be based on the size of the development proposed, existing street and intersection conditions, traffic volumes, accident history, safety considerations, community concerns, and other pertinent factors relating to traffic impacts attributable to the development.

10.16.1 When Traffic Impact Analyses are Required

The following is a list of some specific conditions that may dictate the requirement for preparing a Traffic Impact Analysis.

- The development generates more than 30 PM peak hour trips on a corridor.
- The development may potentially affect the implementation of the street system as outlined in the Comprehensive Transportation Plan and Six Year Transportation Improvement Program (TIP), or of any other documented transportation project.
- The development proposes a rezone of the subject property.
- The original Traffic Impact Analysis for a future development is outdated due to changes in traffic volumes in the vicinity of the proposed project or approved pipeline projects or a change in the proposed land use's trip generation and/or distribution.
- The development could potentially affect safety or requires an analysis to assist in designing appropriate access.

10.16.2 Elements of a Traffic Impact Analysis

Each development traffic review is different and, as such, each traffic study should be cooperatively designed to address the city's specific concerns. Traffic impact analyses are therefore required to be scoped by and with the City Engineer. They may include all or some of the following elements:

- Corridor Level of Service analyses,
- Intersection Level of Service analyses,
- Access point level of service analyses,
- Critical gap analyses,
- Horizontal and vertical sight distance analyses,

- Roundabout analyses,
- Traffic signal warrant analyses,
- Stop control warrant analyses,
- Turn lane warrant analyses,
- Access management design,
- Other analyses and information as required by the City Engineer.

10.16.3 Special Uses

Special event land uses which do not exhibit typical trip generation characteristics may require unique analysis, including but not limited to weekend and off-peak scenarios, and AM versus PM time frames. Examples of such uses would be concert stadiums, racetracks or uses which exhibit substantial traffic peaking associated with special events that are scheduled on a periodic basis.

The traffic analysis for such uses may include a traffic management plan to control traffic impacts associated with the special events.

10.16.4 Mitigation Identification

In order to protect the public from potentially adverse impacts of the proposal, to fulfill an identified need for public services within the impacted area related to the development, or both, the Traffic Impact Analysis shall identify methods of mitigating on-site and off-site deficiencies for present and proposed phases of the development. The analysis shall make recommendations for improvements necessary for safe and efficient traffic flow and bicycle, pedestrian, and transit movement and access proportional to the identified impacts. Build-out Year, Long-Range Forecast Year, and project phasing impacts shall be considered. All or some of the following items are to be included in the mitigation identification:

- Methods for mitigating on-site impacts and mitigation recommendations,
- Methods for mitigating off-site impacts and mitigation recommendations,
- Discussion of whether on-site and off-site improvements are justified, reasonably related to, and proportional to the impacts of the proposed development,
- Any requirements or mitigation measures associated with the Area Circulation Plan.

10.16.5 Recommendations

The Traffic Impact Analysis report shall clearly state the mitigation measures recommended by the analysis and shall summarize how the recommended mitigations are proportional to the identified impacts. The recommended street and highway mitigation measures shall be explained in sufficient detail in the analysis to allow them to be understood and evaluated. The recommendation shall also include the following:

- Clear statements of the applicant's recommended mitigation measures.
- Scaled drawings depicting recommended mitigation improvements and their relationship to existing and proposed conditions if drawings are needed.

10.16.6 Area Circulation Plan

Area Circulation Plans are plans which support the development of a multi-modal transportation network with safe, efficient and pleasant routes for pedestrians, bicyclists, transit users, and motor vehicle occupants. The plan recognizes the link between land use and transportation planning and promotes land use and development patterns that encourage walking, bicycling, and transit use.

The goal of an Area Circulation Plan is to "provide a transportation system that will facilitate the safe and efficient movement of people and goods throughout the community while supporting the designated Land Uses in the Comprehensive Plan." This goal applies to all aspects of circulation including: vehicular, mass transit, bicycle, and pedestrian. In order for the City of Auburn to successfully meet the vision set forth in the Comprehensive Plan, the Area Circulation Plan will need to address a variety of transportation modes to facilitate the convenient and efficient movement of people in and near new development.

Area Circulation Plans are required for all new development of general commercial and industrial property. They also may be required for land uses which do not exhibit typical trip generation characteristics that require unique analysis, including but not limited to weekend and off-peak scenarios, and AM versus PM time frames.

The Area Circulation Plan shall include sufficient information to adequately assess the functionality of the proposed development and its impact on surrounding properties and circulation systems, including but not limited to:

- Mapping details, such as site boundaries and dimensions, site acreage, vicinity map, north arrow, scale, title block, etc.;
- Access to the site and interior site circulation;
- Proposed lot layout;
- Other items which may impact adjacent property, such as general parking arrangement, delivery truck/dock locations, medians or traffic control devices, median breaks, and other information as deemed necessary by the City Engineer and Planning Director.

Any development or subdivision of the property shall generally be consistent with the Area Circulation Plan as approved or amended. No plat, building permit, or certificate of occupancy shall be issued for the property unless all construction and development generally conforms to the Area Circulation Plan.

Table 10-1 Summary Matrix of Minimum Street Design Requirements

CLASSIFICATION	SECTION	PRINCIPAL ARTERIAL			MINOR ARTERIAL		RESIDENTIAL COLLECTOR	NON-RESIDENTIAL COLLECTOR	RUSTIC COLLECTOR			LOCAL RESIDENTIAL	LOCAL NON-RESIDENTIAL	RUSTIC RESIDENTIAL
Average Daily Traffic (ADT)	1.00	Over 15,000			10,000 – 15,000		2,500 – 10,000	2,500 – 5,000	1,000 – 5,000			Up to 1,200	Up to 1,200	Up to 1,000
RIGHT-OF-WAY														
Width (ft.)	10.02.8	87 ⁶			71/82 ⁶		55 ⁶	65	60			50	55	50
Intersection Radii- Min. (ft.)	10.02.9.6	29.5			24.5		14.5	19.5	17			9	19.5	7
TRAVELWAY														
Roadway Width (ft.)	10.02.9	61 ⁶			50/61 ⁶		34 ⁶	44	28			28	34	24
Curb and/or Curb and Gutter	10.02.9.4	Y			Y		Y	Y	N			Y	Y	N
Number Of Lanes	10.01	5			4/5*		2/3*	3	2			2	2	2
Inside Through Lane Width (ft.)	10.02.9.1	11			11		N/A	N/A	N/A			10	N/A	N/A
Curb Lane Width (ft.)	10.02.9.1	14			14		11.5	16	14			10	17	12
Center Turn Lane Width (ft.)	10.02.9.2	11			11		11	12	N/A			N/A	N/A	N/A
Bikeway Class/Width (ft.) ⁵	10.06	Cl. 1 / 10			Cl. 1 / 10		Cl. 2 / 6	N/A	Cl. 3			N/A	N/A	N/A
Intersection Curb Radii (ft.) ¹	10.02.9.6	40***			35***		25***	30***	30			20	30***	20
Parking Allowed	10.02.9.5	N			N		N	N	N			Y, one side	N	Y/ two-sides ⁴
ROADSIDE														
Shoulder Width (ft.)	10.02.9.4	N/A			N/A		N/A	N/A	8			N/A	N/A	3
Sidewalk Width (ft.)	10.05.1	10			10		5	10	0			5	10	0
Street Trees with Grates	10.08	Y			Y		N/A	Y	N/A			N/A	Y	N/A
Landscape Strip Width (ft.)	10.08.1	5 w/ Cl. 1 trail ⁵			5 w/ Cl. 1 trail ⁵		5	N/A	N/A			5.5**	N/A	N/A
Illumination	10.10	Y			Y		Y	Y	Only at Intersections			Y	Y	Only at Intersections
INTERSECTION														
Min/Max Horizontal Approach Angle	10.04.1.2	90° ± 5°			90° ± 5°		90° ± 5°	90° ± 5°	90° ± 5°			90° ± 5°	90° ± 5°	90° ± 5°
Minimum Landing Approach Length (ft.)	10.04.1.5	30			30		20	20	20			20	20	20
Maximum Landing Approach Grade (%)	10.04.1.5	3			3		5	5	5			5	5	5
GEOMETRIC DESIGN CRITERIA														
Posted Speed (mph) ²	10.02.7	45	40	35	35	30	30	30	40	35	30	25	30	25
Design Speed (mph) ²	10.02.7	55	50	45	45	40	35	35	45	40	35	30	35	30
Min. Horizontal Curve Radius (ft.) ^{2, 8} (For Standard Cross Section)	10.02.1	9720	8150	4930	1121	821	544	544	1125	821	544	333	510	333
Min. Tangent Between Reverse Curves (ft.) ²	10.02.2	150			150		150	150	150			100	150	100
Maximum Rate of Superelevation, e (%)	10.02.3	8			8		0	0	8			0	0	0
Max. Vertical Grade (%) ^{2, 3, 7}	10.02.4	6			6		8	8	8			8	8	8
Cross Slope (%)	10.02.6	3			3		3	3	3			2	2	2
DRAINAGE														
Closed System	6.00	Y			Y		Y	Y	Only at Driveways			Y	Y	Only at Driveways
Open System	6.00								Y					Y

* Minor Arterials may be designed as either a four (4) lane road (two lanes in either direction) or a five (5) lane road (two lanes in either direction and a center turn lane) based on the Comprehensive Plan designation. Residential Collectors may be designed as either a two (2) (one lane in either direction) or three (3) (one lane in either direction and a center turn lane) lane road based on the configuration of access points to the collector system.

** Landscape strip / street tree zones may be utilized for approved Low Impact Development treatments.

*** Intersection Curb Radii reduction may be permitted by City Engineer with approved documentation of design vehicle turning accommodation without impacting opposing traffic lanes

¹ At intersections with two different street classifications, use the highest classification for curb radii except at intersections with residential streets where the lowest order street shall be used

² Table values are for standard cross sections with a relatively level grade and are for reference only. For accurate design values reference the AASHTO Manual "A Policy on Geometric Design of Highways & Streets."

³ Vertical curves will be required when the algebraic grade difference is more than 1%.

⁴ Parking shall be located where space is available, outside of the required three-foot (3') shoulder.

⁵ The construction of separated bikeways shall be required in conjunction with street projects when designated by the Comprehensive Plan.

⁶ Required pavement and right-of-way widths may be greater than that shown to accommodate medians and/or bike lanes as required to meet Comprehensive Plan designations or to address traffic calming. See Section 10.06.

⁷ Vertical grades may be increased to 10% for non-arterial streets upon approval of the City Engineer.

⁸ Minimum radii are for streets designed using the recommended cross slopes listed above. Minimum street radii for Arterials and Rustic Collectors may be reduced by superelevating the street section per the requirements above. Horizontal curve radius for local Residential roads can be reduced to 100 feet approaching cul-de-sac's.

Chapter 11 City Telecommunication Utility

11.02 Preface

The design of City Telecommunications facilities located within City right-of-way shall be in conformance with these standards.

Compliance with these standards does not alleviate the design engineer from using sound professional engineering practices. The design criteria contained herein are the minimum acceptable under standard conditions. Special conditions may require more stringent requirements that will be addressed during the plan review process.

City telecommunications facilities shall be included in the Public Facility Extension Agreement (FAC) between the developer and the City when the Agreement includes street improvements per ACC 12.64.

11.03 Design Criteria

The City has established the following minimum requirements to ensure the efficient construction of City telecommunication utilities with the least impact to City transportation and other utility infrastructure. The design of City telecommunications facilities shall also meet the requirements of **Section 9.01.2**, Public and Private Utilities Located Underground Within City Right-of-Way with the exception that a construction permit is not required if this work is completed as part of a Facility Extension Agreement.

City telecommunications facilities may be required in conjunction with street improvements on all roadways classified as Arterial or Collector. Such facilities, when required, shall be extended the full length of the street improvement. When feasible, placement of the facilities shall accommodate connection with other existing or future telecommunication facilities within the corridor.

11.01.1 Conduits

City telecommunication conduits shall be 3-inch PVC Schedule 40 and shall have a minimum of 24 inches of cover and, except for street crossings, shall be located under the sidewalk per **Standard Detail T-23**. If no sidewalk is included in the scope of the required street improvements, the conduit will be installed in the most feasible location within the street construction limits as directed by the City. Roadway crossings shall be minimized and sweeps shall be long sweep 90-degree bends. Trace wire shall be placed within the conduit. Conduits shall be placed a minimum of 5 feet from other utilities.

11.01.2 Splice Vaults and Pull Boxes

When required, splice vaults and pull boxes shall be per **WSDOT Standard Plans J-90.21 and J-90.10**, respectively, except that lid marking lettering shall be as specified in the Construction Standards and lids shall not be marked with WSDOT logos or text indicating WSDOT. Splice vaults shall be placed every 1,500 feet. Pull boxes shall be placed every 500 feet and at all arterial and collector intersections.